



ICT in Serbia

At a Glance

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Vojvodina ICT Cluster is a recognized partner in the development and application of new ICT products and services with high profit potential and an important partner in the development of individuals, companies and regional businesses.

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The Institute for Territorial Economic Development (InTER) was established in 2006 as a not-for-profit independent non-governmental think tank, with the mission of promoting and advancing sustainable socio-economic territorial development in the Western Balkans. InTER is registered with the Ministry of Public Administration and the Local Self-Government of the Republic of Serbia under no. 3959/11298.

InTER is active in a range of issues including local and regional development, strategic planning of territorial development, cluster and private sector development, public administration reform and EU project development. InTER works with highly experienced scholars and practitioners in all its fields of operation.

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ACRONYMS AND ABBREVIATIONS

ACCESS	Assistance to Competitiveness and Compatibility with the EU of Serbian SME
ACS	Advance Control Systems
ASIT	Association for Computing, Informatics, Telecommunications and New Media of Serbia
BCM	Business Content Management
BPTO	Business Process and Technology Outsourcing
BMZ	Deutsches Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
CIP	Competitiveness and Innovation Programme
CMMI	Capability Maturity Model Integration
CRM	Customer Relationship Management
DED	Deutscher Entwicklungsdienst (DED) gGmbH
DIS	Drustvo za Informatiku Srbije (Informatics Association of Serbia)
DT	Drustvo za Telekomunikacije (Association for Telecommunication)
ECM	Enterprise Content Management
EEN	Enterprise Europe Network
EIP	Entrepreneurship and Innovation Programme
ERP	Enterprise Resource Planning
ETF	Elektrotehnicki Fakultet (School of Electrical Engineering)
EU	European Union
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
FDI	Foreign Direct Investments
FIT	Faculty of Information Technology
FON	Faculty of Organisational Sciences
FP6, FP7	Framework Programme 6, Framework Programme 7
ICT	Information and Communication Technologies
ICT-PSP	ICT Policy Support Programme (under CIP Programme)
IEEE	Intelligent Energy Europe Programme
IMP	Institute Mihajlo Pupin
Inwent	Internationale Weiterbildung und Entwicklung gGmbH
IPA	Instrument for Pre-Accession
ISS	Information Society of Serbia
IT	Information Technologies
itSMF	IT Service Management Forum
JISA	Jugoslovenski Informaticki Savez (Union of ICT Societies in Serbia)
JURIT	Association of Accounting, Informatics, Telecommunications, Automatics and Management in Serbia
MDCS	Microsoft Development Center in Serbia
MERD	Ministry of Economy and Regional Development of the Republic of Serbia
MSTD	Ministry of Science and Technology Development of the Republic of Serbia
MTIS	Ministry of Telecommunications and Information Society of the Republic of Serbia
NARD	National Agency for Regional Development
NITIA	National Information Technology and Internet Agency
OECD	Organisation of Economic Co-operation and Development
R&D	Research and Development
RATEL	Republic Agency for Electronic Communication
RNIDS	Serbian National Register of Internet Domain Names
SCoC	Serbian Chamber of Commerce
SECEP	Support to Enterprise Competitiveness and Export Promotion - EU IPA Project
SEE	South East Europe
SIEPA	Serbia Investment and Employment Promotion Agency
SME	Small and Medium-sized Enterprises
SSC	Serbian Software Cluster
SWOT	S-Strengths, W-Weaknesses, O-Opportunities, T-Threats
ToR	Terms of Reference
UNDP	United Nation Development Programme

USAid	U.S. Agency for International Development
VIP	Vojvodina Investment Promotion (fund)
VOICT	Vojvodina ICT Cluster
WBF	(Programm für) Wirtschafts- und Beschäftigungsförderung (in Serbien)

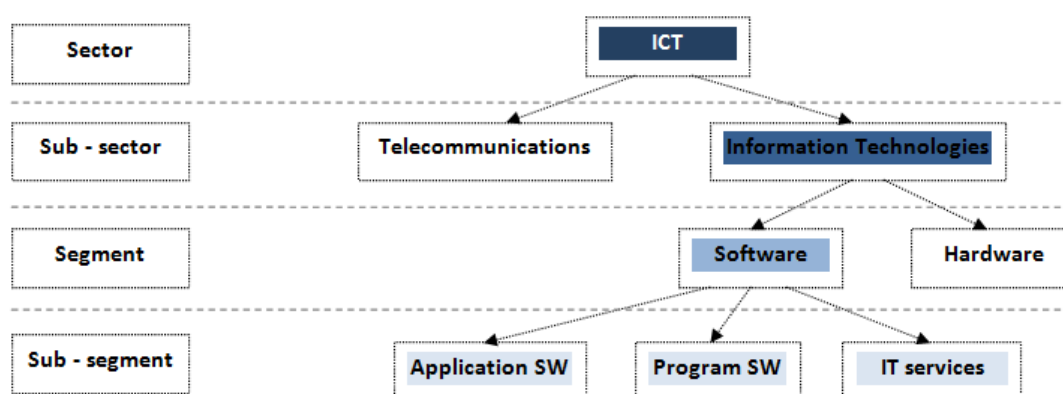
INTRODUCTION

Information and Communication Technologies (ICTs) undoubtedly constitute one of the key innovations of the last century. ICTs are composed of a wide range of product and service technologies including computer hardware, software and services and a host of telecommunication functions that include wire or wire-line, as well as wireless and satellite products and services. The rapid diffusion of ICT has produced important changes in how and where goods and services are produced, the nature of those goods and services, and the means by which they are brought to the market and distributed to consumers. This implies that ICT has had an impact on the industrial structure of regions and on the geographical location of different industries not only within the EU but worldwide. ICT has also influenced the relationship between customers and suppliers and the way many markets for intermediate and final goods and services are organised.

Various studies define the ICT sector differently. OECD defines Information and Communication Technology as a combination of manufacturing and service industries, whose products capture, transmit or display data and information electronically. In addition, “The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display” (OECD, 2009).

Since the data available for the Serbian ICT market are not structured in a consistent way and might not be detailed enough, throughout this study a traditional and simple definition of the ICT sector will be applied. According to this definition, ICT sector is divided into two sub-sectors: communications and information technologies. Furthermore, information technologies sub-sector comprises two segments which are software and hardware. Finally, since it is the focus of this study, it’s important to say that the software sub-sector consists of application software, system software and IT services. The graph below gives an overview of the segmentation above described.

Chart No.1: ICT sector definition



ICT is among the most vibrant and fastest growing sectors in Serbia, with a two-digit annual growth in the years prior to the crisis. However, the economic crisis hit Serbia heavily, creating significant negative consequences to the ICT industry as well. In 2009 alone, the IT market in Serbia fell by 22.20%. There was an urgent need for screening in the ICT sector and identification of the major obstacles for growth and development.

This study presents an overview of the ICT sector in Serbia. The analysis is structured into six thematic fields: statistical overview of the Serbian ICT sector, General Business Environment, Education and Human Resources development, research and development, networking and cooperation and finally, current situations, trends and potentials.

The study with its analyses and informations has been designed to serve as tool for policy makers, business support organisations and international development organisations for the assessment of the current status of the ICT Sector in Serbia and the evaluation and creation of respective activities and policies for the development of the IT Sector in Serbia. Finally, the study is seen as a valuable document to the ICT companies in Serbia and other parties interested in this topic.

ASSESSMENT OF THE ICT SECTOR

The assessment of the ICT sector in Serbia has been done within **six thematic fields**, herewith presented under separate titles. The assessment and the materials are based on the qualitative interviews with the key stakeholders and secondary source literature, collected from various sources. As a result of this assessment, the SWOT matrix of Serbian ICT Sector is also presented.

A. STATISTICAL OVERVIEW OF THE SERBIAN ICT SECTOR

This chapter provides basic information needed for an insight into the Serbian ICT sector, such as:

- **Market value**
- **Market structure**
- **Geographical market dispersion**
- **Number of companies, employees, income/turnover in Serbian ICT industry**
- **IT spending and investment in Serbia**
- **Usage of IT by households and business in Serbia**

As mentioned in the Introduction, for the purpose of the analysis the ICT sector has been divided between telecommunications and IT sub-sectors, whereas IT has been further split between software-, and hardware-related segments. The provided analysis interchangeably focuses on ICT sector in general and software and its sub-segments: application software, system software and IT services.

ICT is among the most vibrant and fast growing sectors in Serbia, with a two-digit annual growth in the years prior to the crisis.

Market value

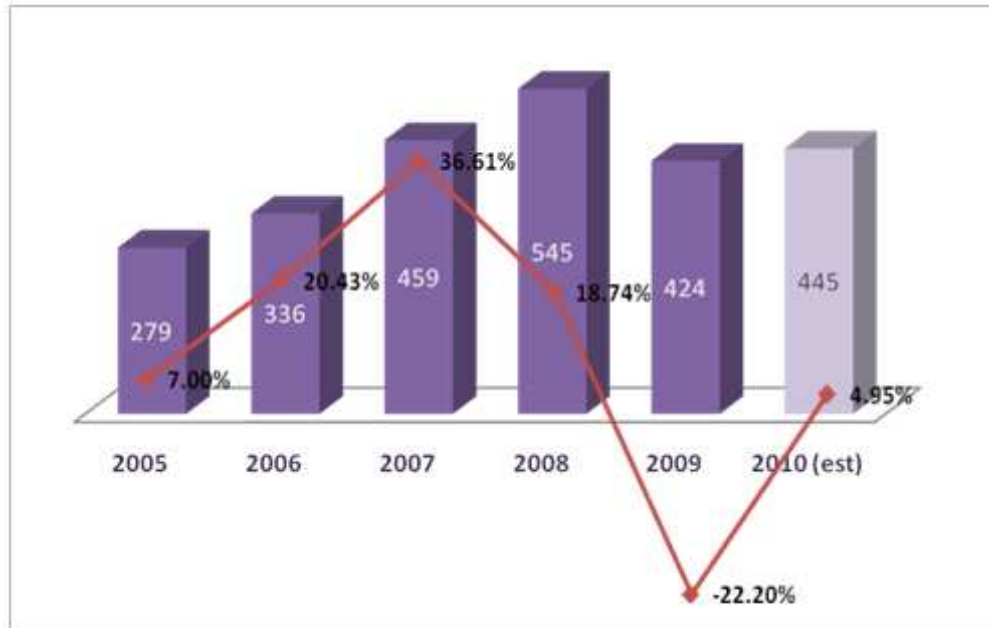
The telecommunications sub-sector in Serbia was worth about €1.51 billion in 2009. The average annual growth rate of the telecom sub-sector revenues in the period 2005-2009 was 13%. The share of telecom sub-sector revenues in GDP was around 4.76% (4.87% in 2008). The total investments in telecom sub-sector amounted to €288 million 2008.¹ Telecommunications generate about 4.5 – 5% of GDP and employ about 50,000 people in about 2,500 companies (SIEPA 2009, Bednarik 2010, Radovic).²

In the period 2005-2008, **the IT sub-sector** in Serbia grew from €280 million to €545 million (SIEPA 2009). In 2007 alone the market grew by 36.61%, followed by 18.74% in 2008 (see Figure 2). The IT market grew due to the growth of other sectors, introduced structural reforms and privatization as well as an inflow of FDI. However, the IT market dramatically declined with the financial crisis, falling by 22.20% in 2009 to €424 million (Bednarik 2010 MINECO 2010). The estimation for 2010 is for positive growth of almost 5%; however, this might be taken with reserve since the final figure depends on many factors, including fluctuation of the national currency compared to the US Dollar.³

¹ Ratel, An overview of telecom market in the Republic of Serbia in 2009

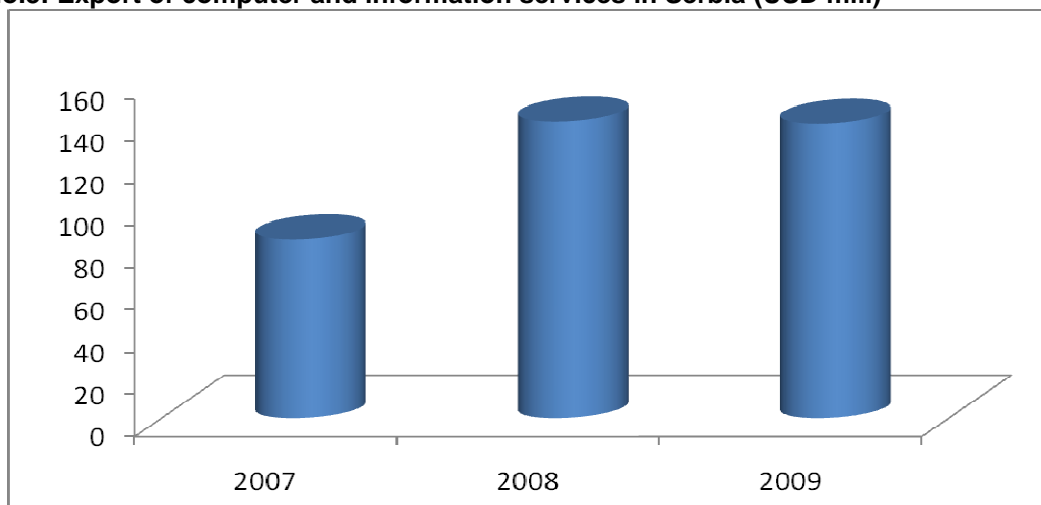
² While Bednarik (2010) estimates more than 2,500 companies and 70,000 people employed in Serbia's ICT sector, Radovic () is giving figure of 2,300 ICT companies with more than 60,000 people employed.

³ Serbian companies purchase electronic goods from East Asia, therefore they are heavily affected by instability of the exchange between national currency (RSD) and US Dollar.

Chart No.2: IT Market Value in Serbia (mill €)⁴

Source: MINECO 2010

When it comes to export of the IT services (computer and information services), according to the data provided by the Serbian Chamber of Commerce, there has been a significant growth in the year 2008 comparing with previous years, after which its value slightly went down.

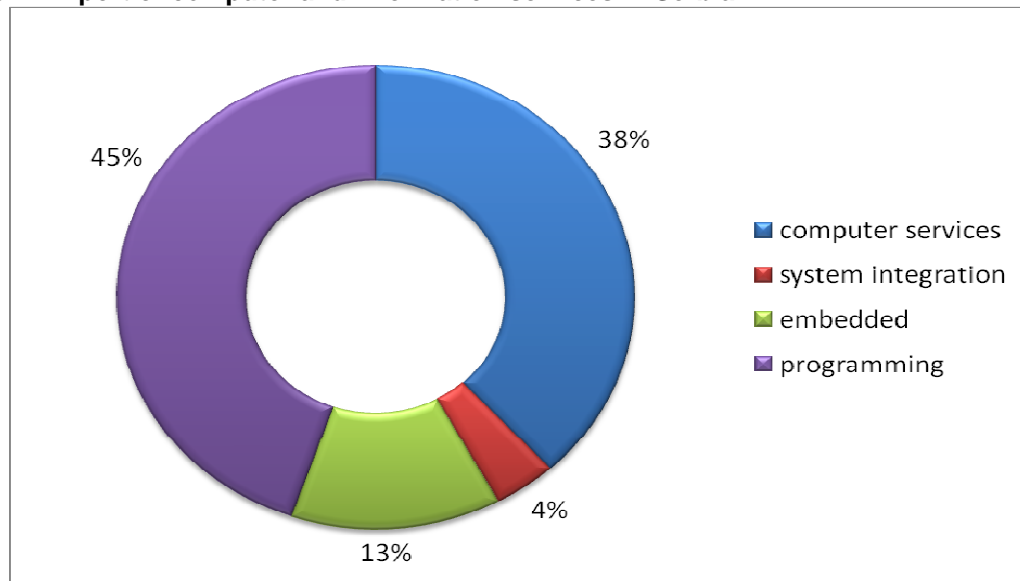
Chart No.3: Export of computer and information services in Serbia (USD mill)⁵

Source: Serbian Chamber of Commerce 2010

In the structure of the export of computer and information services, programming and computer services dominate followed by embedded and system integration, as shown on the next chart.

⁴ PC Press: <http://www.pcpres.info/info/osvrti/it-trzite-u-srbiji-2009-2010/>

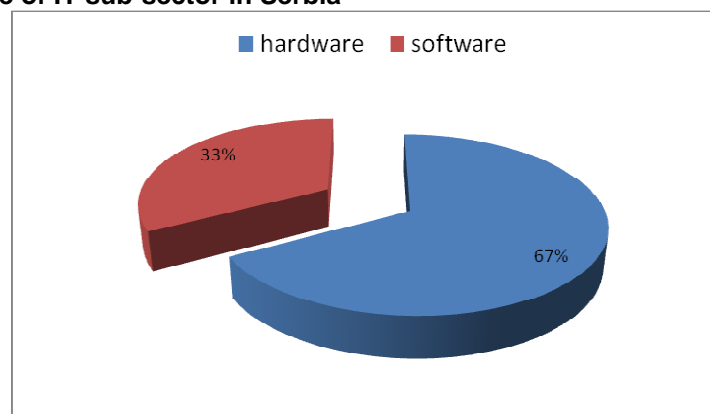
⁵ ICT Sector in Serbia; Serbian Chamber of Commerce 2010

Chart No.4: Export of computer and information services in Serbia⁶

Source: Serbian Chamber of Commerce

Market structure

As mentioned earlier, throughout this study it is differentiated between software and hardware segments of IT sub-sector. According to MINECO, about 67% accounts for the hardware segment which includes PC sales, locally assembled computers, notebooks, printers etc, the remaining 33% for the software segment which includes software development and services.

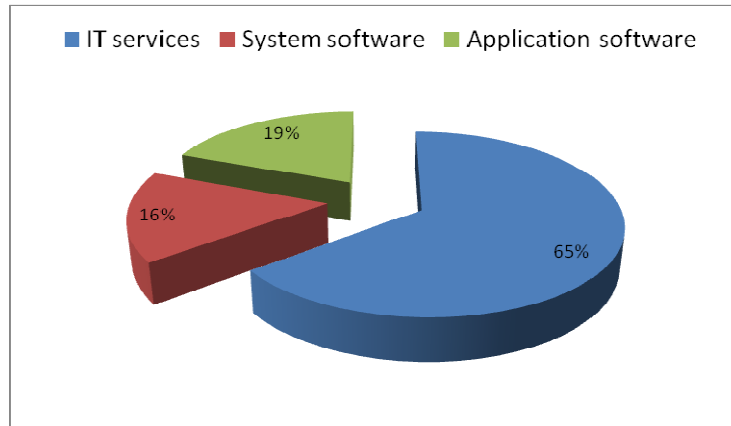
Chart No.5: Structure of IT sub-sector in Serbia

Source: MINECO 2010

As main software sub-segments **system software, application software and IT services** can be listed. According to MINECO data out of above mentioned 33% of software segment even more than 21% accounts for IT services. The rest of it is almost equally divided between system programs (5.3%) and application programs (6.3%), as shows the next chart.

⁶ ICT Sector in Serbia; Serbian Chamber of Commerce 2010

Chart No.6: Structure of IT sub-sector in Serbia⁷



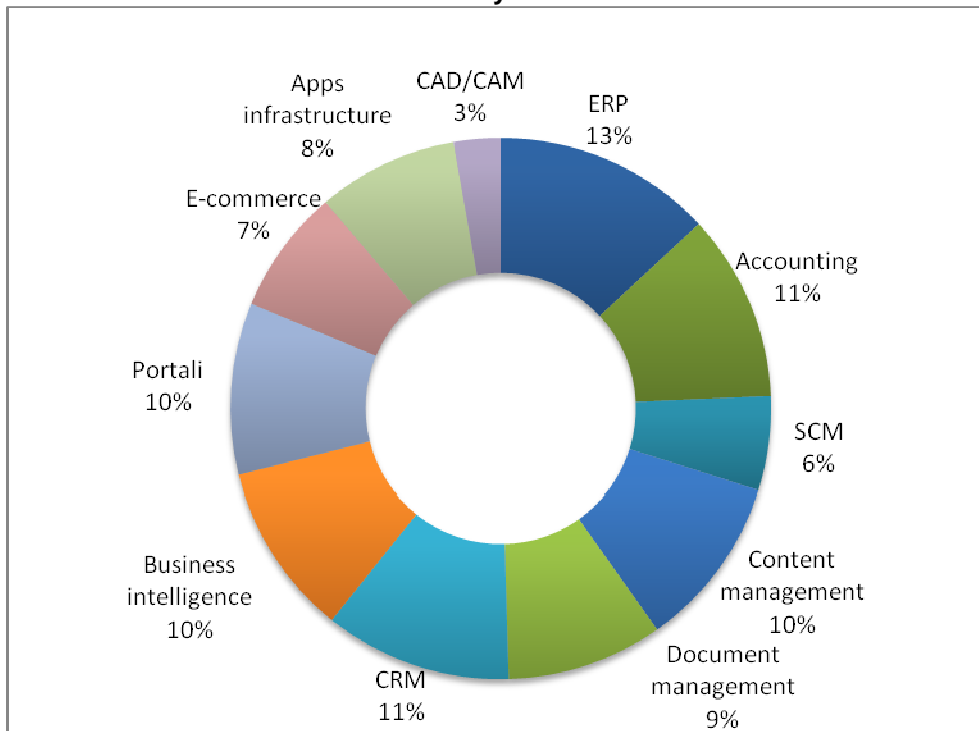
Source: MINECO 2010

When it comes to application software sub-segment its share in the whole IT market is 6.3%. The following data is providing a deeper insight:

- ERP - 4.1% of whole IT sector
- Common applications, SCM, accounting, e-business, e-mobility, CAD/CAM, games etc. – 2.2% of the whole IT sector

On even more detailed level the structure of the supply side of the software segment of the ICT sector looks as showed on the following chart.

Chart No.7: Products in Serbian software industry⁸



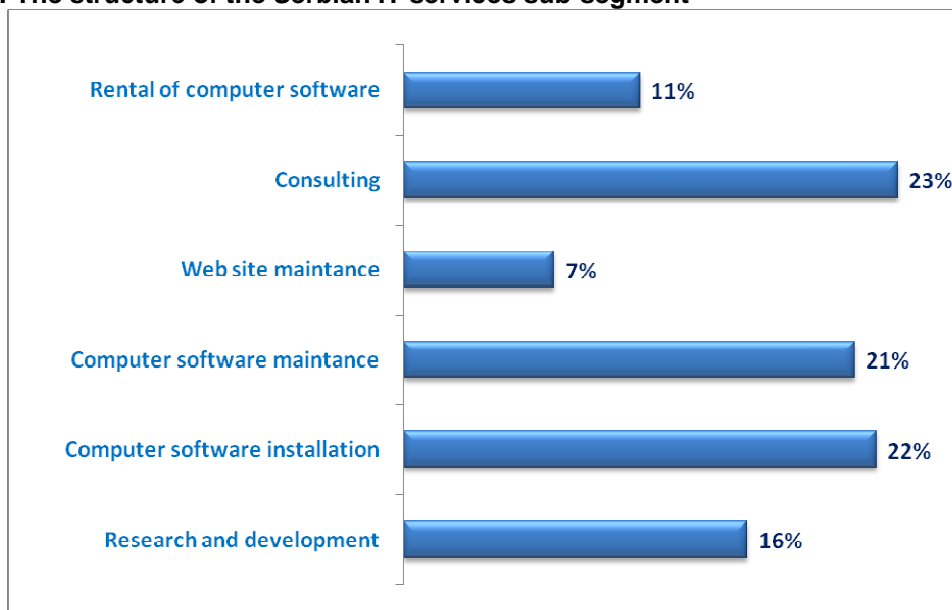
Source: Serbian Chamber of Commerce

⁷ SITO 09 (Serbian IT Observer), March 2010, MINECO Computers Belgrade

⁸ ICT Sector in Serbia; Serbian Chamber of Commerce 2009

According to the data provided by the Serbian Chamber of Commerce, structure of the supply side of the Serbian IT services is as shown on the chart below.

Chart No.8: The structure of the Serbian IT services sub-segment⁹



Source: Serbian Chamber of Commerce

Number of companies and employees in ICT sector

Similar to the case of establishing the number of companies in the telecommunications sub-sector, it is very difficult to determine the number of companies in the IT sub-sector. SIEPA (2009) refers to more than 1,300 companies with about 10,000 employees. Bednarik (2010) estimates about 1,400 companies with more than 10,000 workers. The most accurate estimate is probably the one given by Mineco, which came out with 12,193 IT experts in 1,544 companies, which are not only in IT but in other sectors also (such as banks, financing, telecommunications, media, etc)¹⁰. MINECO also estimated about 2,000 graduates in the ICT field annually¹¹. Ivkovic and Pantelic (2008) have provided a table of 1,527 companies and 2,217 entrepreneurs/artisans. These figures are similar to SECEP (2010), which estimates 3,624 companies (1,603 companies and 2,021 entrepreneurs/artisans) and 9,747 people employed. The last two references used information provided by the Serbian Business Registry Office, which explains why the figures are so similar. Therefore, it leads to the conclusion that the **number of IT companies** is between 1,520 and 1,600, excluding artisans and entrepreneurs (2,021).

Recognizing the problem of ambiguous information on the number of ICT companies in Serbia, in 2009 GTZ/WBF implemented the research study called 'the ICT Directory in Serbia 2009' (GTZ/WBF 2009). Out of 2,500 IT companies which were initially identified 300 of them were chosen to be interviewed and listed in CD-ROM and print-out version of ICT Directory in Serbia.

When it comes to **geographic distribution** of ICT companies in Serbia it's important to mention that SECEP has produced the Report on geographical concentration of industries and services in Serbia (so called 'Cluster Mapping Report'), developed on the ground of 3-star Cluster Mapping methodology developed by the EU Cluster Observatory¹². Based on the SECEP Cluster Mapping Report, ICT

⁹ ICT Sector in Serbia; Serbian Chamber of Commerce 2009

¹⁰ See PersonalMagazin article "Uskoro otvaranje IT parka u Indjiji" (in Serbian) at www.personalmag.rs/tag/mineco, last accessed on September 19, 2010.

¹¹ Ibid

¹² 3-star Cluster Mapping methodology measure geographical concentrations of industries and services based on the 4-digit NACE codes where one star is awarded for three criteria: (1) Size: where municipal/regional concentration of the sector is significantly higher than national concentration; (2) Dominance or Weight, where concentration of a specific sector is higher than average concentration at the municipal/regional level; and (3) Specialization, where ratio of

companies are concentrated at the 2-star level in Belgrade (Novi Beograd and Stari Grad) and Novi Sad. Concentrations at one-star level are visible in majority of Belgrade city municipalities, Nis and its city municipalities and few other cities and municipalities across Serbia. However, vast majority of other municipalities in Serbia have an insignificant concentration of ICT companies (SECEP 2010).

Applying the 3-star cluster mapping methodology on the dataset developed by GTZ/WBF and distributed by CD-ROM, one can see the same concentration as illustrated by the SECEP report. Namely, the majority of companies in the dataset are from Belgrade (377 companies), being principally located in the municipalities of Stari Grad and Novi Beograd. Beside Belgrade, companies are significantly concentrated in Novi Sad (71 companies) and in Nis (41 companies).

Further analysis could be done by classifying these companies on the general basis of software development activities, hardware development & computer assembling/manufacturing activities and telecommunications. Companies that do not fall within any of these three classifications are assigned to the category 'others'.

Table No.1: An Overview of Number of Employees and Companies:

Type of Activity	No of Employees	No of Companies	Belgrade	Novi Sad	Nis	Else-where
Software development, Software-related consultancy, Database development, etc.	3,624	228	143	31	12	42
Manufacturing computers and components, Hardware-related consultancy, etc	3,845	268	160	30	22	56
Telecommunications	13,788	99	61	6	5	27
Other (retail, IT and business consultancy, engineering, etc).	221	23	13	4	2	4
Total	21,478	618	377	71	41	129

Source: GTZ/WBF ICT Directory of Serbia 2009.

As the Table 2 shows, most companies are operating in the field of hardware, followed by software-related services. However, although having only 99 companies in sector of telecommunications, they are generating far higher levels of employment than other two IT sectors combined (see Table 2).

Table No.2: Overview of the structure of number of employees and companies:

Type of Activity	No of Companies	Number of Employees per Company					
		≤15	16-50	51-100	101-500	>500	n/a
Software development, Software related consultancy, Database development, etc.	228	162	42	14	4	0	6
Manufacturing computers and components, Hardware-related Consultancy, etc	268	215	38	9	5	0	1
Telecommunications	99	71	15	4	6	3	0
Other (retail, IT and business consultancy, engineering, etc).	23	19	3	0	0	0	1
Total	618	467	98	27	15	3	8

Source: GTZ/WBF ICT Directory of Serbia 2009

The table also confirms the finding that Serbian ICT sector is characterized by micro- and small enterprises. More than 75% of listed companies have less than 15 workers. Furthermore 41% (253

concentration at the municipal/regional level is higher than ratio at the national level. More information on the cluster mapping methodology and results for Serbia might be found in SECEP 2010 or at the website of EU Cluster observatory, www.clusterobservatory.eu.

companies) have less than 5 employees. Only three telecommunication companies have more than 500 employees (see Table 3).

Income/turnover

Looking at the turnover of the 50 leading companies in IT sub-sector it's notable that the growth rate of their incomes (42%) is significantly bigger than for the rest of the companies in the sub-sector (25%) in period 2008-2009. When it comes to employment the situation is opposite. Their personnel have grown by 22% while in other companies by 24% in the same period.

Table No.3: An Overview of the No of Employees and Turnover of 50 biggest Serbian IT Companies

	No. of comp	No. of employees	Turnover (000EUR)
50 biggest comp.	50	3,379	678,131
Others	1,494	8,814	470,537
Sum	1,544	12,193	1,148,668
	%	%	%
50 biggest comp.	3%	28%	59%
Others	97%	72%	41%
Sum	100	100%	100%

Source: MINECO 2010

IT and internet usage in Serbia

Every year the Statistical Office of the Republic of Serbia publishes statistics on the usage of ICT in households and businesses (RZS 2006, 2007, 2008, 2009, 2010). The report for 2010 showed that 98.7% of households have TV sets, 82% have mobile phones, 50.4% have personal computers and 11.2% have laptop computers. Ownership of ICT equipment is mostly concentrated in the urban population with a monthly income of more than 600€ (86.2%).

The overall usage of computers in Serbia is still unsatisfactory, with 43.70% of the population having no access to computers. The number of users has increased by a symbolic 1% in 2010. Among different groups in the population, students are the most active in using computers (99.20%), followed by employees (73.8%). In real figures, about 2.28 million people in Serbia use computers every day, which is about 200,000 more than in 2009.

In Serbia, 39% of households have Internet access, which is 2.3% more than in 2009 and 5.8% more than in 2008 (RSZ2010). In Belgrade, 51.30% of households have the Internet, in Vojvodina 41.8% and in Central Serbia 31.70%.

The Internet is mostly accessed by DSL (ADSL) connections (47.30%), followed by other Cable/LAN connections (24.50%) and WAP/GPRS (20%). In 2010, Internet access through modem/dial-up connections has decreased by 11.8%, as a direct result of recent investments in broadband infrastructure.

In Serbia, 1.7 million people use the Internet on a daily basis. Most of them use the Internet at home (84.2%). E-mail communication is the most significant reason for using the Internet (77.8%). The survey estimates that more than 350,000 people use e-Government services in Serbia, which is an increase of 40,000 compared with data from 2009.

Use of ICT within companies is more widely spread than in households, with 97.8% of companies using computers in doing business. All large-, and medium-sized companies (100%) possess computers, while the percentage is a bit smaller within micro- and small-sized enterprises (97.1%). Among companies that use computers, 79.7% have Wire-based LAN, 57.3% Intranet, 46.9% Wireless LAN and 13.7% Extranet.

The majority of companies (96.8%) in Serbia have access to the Internet, using mostly DSL (xDSL, ADSL) as a connection (74.1%). The majority of companies that have an Internet connection use e-

Government services (70.6%). Only 67.50% of companies that have an Internet connection have their own company website.

The survey also showed rather weak results in e-Commerce. Only 23.3% of companies that have the Internet were engaged in purchasing goods/services online (0.9% more than in 2008) and 20% of companies were approached through the Internet to deliver goods/services (0.1% more than in 2008). Only 21% of Serbian companies have adopted policies on protection of information and property.

Only 11.50% of Serbian companies use Enterprise Resource Planning (ERP), most of which are large companies (43.1%) then medium-sized companies (17.8%) and finally, small companies (7.6%). Use of Customer Relationship Management (CRM) systems is even weaker, only 8.5%.

The survey showed the usage of IT in Serbia is still in a developing phase. High penetration of IT into Serbian households and companies has been slowed down in the last two years, mostly due to the economic crisis. However, the main question is how much the ICT sector would be able to grow in the years of, and directly following, the recession. The Statistical Office data showed a great market potential in providing services in introducing IT solutions such as ERP and CRM. Website development also has market potential. Demand for delivery of hardware solutions continues to remain high.

In their analysis, MINECO argues on the necessity of IT sector growth at 19% per year for the period 2010-2014 (5 years), otherwise the Serbian economy will fall into a deeper crisis (MINECO 2010).¹³ In that regard, the role of the Government is very important. In order to support the ICT sector, earlier this year the Government of Serbia adopted a bylaw that gives subvention loans for purchasing domestically produced hardware and software. So far there has been no analysis of the impact of this policy on the ICT sector, however.

¹³ Although the Statistical Office claimed the Serbian economy got out of the recession in the first quarter of 2010, the situation can still be considered as dramatic, especially among micro- and small-size enterprises.

B. GENERAL BUSINESS ENVIRONMENT

This chapter provides the following information:

- overview of current business environment in Serbia
- legislation framework – in general and ICT related
- finance (supply and demand)

Current business environment in Serbia

Ten years after democratic change, the **Serbian economy is still in transition**, having a rolling coaster ride between years of positive and negative economic growth. Rapid growth of the Serbian economy in the period 2004-2007 with an average GDP growth rate of 6.8% (reaching peaks of 8.4% in 2004 and 7.5% in 2007), followed by collapse with the economic crisis in 2008 and onwards, which caused a decline in GDP of about 3% in 2009. Economic projections for the subsequent years (2010-2013) showed a slow recovery, with zero or insignificant growth in 2010 and an estimated growth of no more than three percent in 2011, based on ongoing developments in the global economy as well as new fiscal policies adopted by the Serbian Government (World Bank 2009).

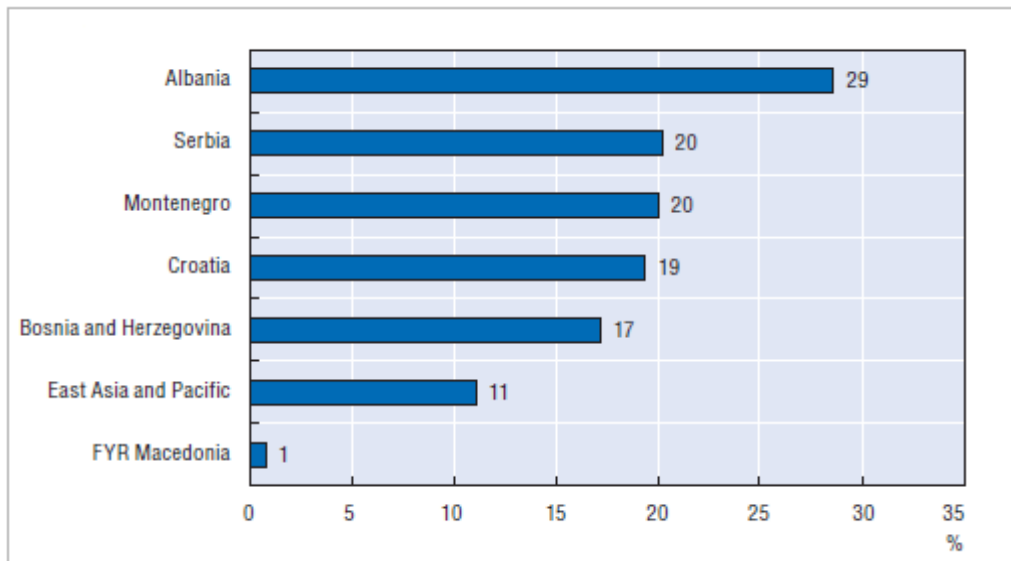
Serbia has a problem with macroeconomic stability. The inflation rate is above 10% and unemployment is above 18%. Based on the Global Competitiveness Index for 2010-2011, Serbia is placed 96th¹⁴, behind almost all European countries.

Economic development policies in Serbia mainly focus on **the attraction of FDIs**. However, since achieving a maximum in 2005 with \$5.47 billion USD¹⁵, FDI inflows have dramatically reduced. The main reasons are political instability caused by Kosovo's declaration of independence and the global financial crisis. However, bureaucratic and insufficiently reformed public administration and high levels of corruption are also among key reasons for not having more FDI in Serbia.

As a measure for reducing the negative impact of the current economic crisis, the Government has increased a package for foreign companies interested in setting-up their businesses in Serbia. Besides having one of the lowest corporate tax rates in Europe (10%), the Serbian Government is giving generous non-refundable grants that can be up to €10,000 per employee. Recently, these measures have also become available to Serbian companies that can invest in new factories. However, after 10 years of transition, it is possible to conclude the FDIs did not generate a positive impact on growth and development of national industry and services to the extent expected. Often FDIs come solely driven by the cheap labour force and favourable tax policies, having no interaction with local suppliers or service providers. These attitudes make it difficult for Serbian ICT companies to penetrate this market.

¹⁴ The Global Competitiveness Report 2010 – 2011, please visit: <http://gcr.weforum.org/gcr2010/>, last accessed September 20, 2010.

¹⁵ SIEPA Website: http://www.siepa.gov.rs/site/en/home/1/brief_guide/benchmark_serbia/fdi_inflow/, last accessed on September 20, 2010.

Chart No.9: Social Charges as a Percentage of Gross Wages¹⁶

Source: World Bank (2007)

Due to the limited human resources available in the market, from the perspective of local companies operating in ICT sector, FDIs are seen more as a threat than a benefit. Namely, foreign companies tend to attract good ICT experts with higher salaries, often leaving national companies without their key professionals.

Although the quality of Serbian **ICT infrastructure** is not at the level of EU countries, it is getting better with each year. Quality of infrastructure has improved by 150% over the last three years. In addition, the quality of ICT infrastructure does not present significant obstacles to doing business in Serbia since most of the ICT companies are concentrated in Belgrade, Novi Sad and to some extent Nis, where the quality of ICT infrastructure is much better than in other parts of Serbia.

It's also worth mentioning that the Indian company 'Embassy Group' started building a 600 million-USD-worth IT Park in the Vojvodina town of Indjija. The Park should be finished by 2013 and will be spread over 250,000 m², making it Europe's largest. The Park will provide housing to IT services and technology providers employing up to 25,000 individuals (though not exclusively IT experts). According to all assessments, at the moment Serbia has about 10-12,000 IT experts with an annual inflow of 2,000 graduates. Therefore, by 2013 (when the Park is completed), Serbia will ideally have about 18,000 IT experts, which is not enough to satisfy the demand of the IT Park. Therefore, opening of the IT Park will certainly create disturbances in the Serbian IT labour market.

When it comes to **the standardisation of Serbian companies** the general conclusions appears to be that it is driven by the demands from foreign partners importing from Serbia. Requirements for standardisation are also related to the nature of the produced goods. For instance, embedded industry produces innovative goods in the field of medical appliances, which requires sector-related standards. However, one can conclude that, in many cases, companies are not aware which set of standards they need to introduce, nor where or how they can get those standards. These issues significantly undermine the competitiveness of Serbian industry

Legislation framework

Doing business in the ICT field in Serbia is not easy. Although legislation has been drastically improved in recent years, remaining obstacles are still numerous. Due to outdated regulations and bureaucracy, business operations in Serbia are very expensive, which makes the Serbian ICT sector less competitive than ones elsewhere in the region.

¹⁶ Sector Specific Sources of Competitiveness in the Western Balkans; OECD 2009; page 176

Doing business in **telecommunications is better regulated than in the IT sector**. Due to its size, the telecommunications sector has attracted some of the major multinational companies in that sphere (such as Telenor and VIP in terms of mobile phone providers). The state monopoly over landline telephone provision will be liberalised to a free and open market by introducing a new operator called *ORION*, and by the forthcoming privatisation of the state-owned telecom company.

The telecommunication sector is regulated by the Republic Telecommunications Agency (RATEL), an autonomous national regulatory authority established under the Telecommunications Law with the mandate of ensuring efficient enforcement and promotion of the policy set within the telecommunications sector in the Republic of Serbia, and aiming at providing conditions for the advancement of media and telecommunication sector. RATEL has been developed into a strong agency with a high reputation among all actors in the sector. Every year RATEL publishes an overview of the telecom market in Serbia (RATEL 2006, 2007, 2008, 2009), which present a good source of information in this field.

However, **doing business in the IT sector has far more difficulties**, mostly due to its small size, segregated industry, lack of specialisation, small turnover and many other issues.

For instance, most hardware goods are imported. However, customs regulations are so outdated that computer screens are considered as TV sets, which drastically increases the customs tax base. Furthermore, any imported good has to go through a customs office, which is a procedure that costs about 50-60 Euros. On a practical level, this means that if a company orders a hardware component which is worth €1, they will have to pay €50-60 for customs.

Export of software is also not properly regulated. Due to Serbian regulations, it is not clear whether export of software is considered as the export of goods or of services (for which there is a significant difference in the tax base). All companies that calculate export of software as a service have to pay a significant tax penalty.

Table No.4: Overview of Tax rates for IT equipment:

Type of Tax	Tax rate
Customs for Computers	1%
Customs for server components	18%
Customs for equipment for data storage	18%
Customs for monitors (since all monitors have DVI ports they are considered as video (not computer) equipment and the tax fee is higher)	15%
Attests and certifications fee: the expenses are between 8,000 and 25,000RSD (~80-250€).	RSD 8,000 – 25,000 (80-250€)
On top of the attest and certification fee is a fee for so called 'the safety report', which is about 70,000RSD (~700€) per each order of the goods	70,000 (~700€)
Fee for copyright protection. There are 5 agencies for copyright protection and to each of them should be paid 100RSD (~1€), total 500RSD (~5€)	500RSD (~5€)
Eco-tax (environmental protection tax)	1.2% - 21%
Retail margin	3% - 7%
VAT Tax for Computers	8%
VAT Tax for Server Components	18%

Source: PC World MIKRO¹⁷

¹⁷ PC World MIKRO, article "Šta još pored ekološke takse opterećuje cenu IT opreme?", www.mikro.rs/main/index.php?q=vest&ID=12962 (in Serbian), last accessed September 20, 2010.

The ICT sector also faces common difficulties for doing business in Serbia. Difficulties in obtaining necessary state licences (especially construction licences), long trials at court and non-transparent public procurement are only some of the numerous obstacles that harm the business sector in Serbia.

Finance (demand and supply)

The expensive credit market in Serbia is another obstacle for doing business operations. However, due to the small scale of the ICT sector in Serbia, especially its IT part, this obstacle is not so significant for those companies that are focusing primarily on outsourcing. On the other hand, for companies trying to increase the level of their operations obtaining capital needed is an issue. Developing, patenting and marketing own products take not just time but also the capital that Serbian IT companies are lacking. At this moment there is basically **no seed or early stage capital** available and there are almost **no venture capital funds** active in this market.

That is way instead of developing products IT companies are focusing on outsourcing projects (which do not generate any IP/patent relevant knowledge or directly marketable product) and only the time left between outsourcing contracts is used to work on their own products which is not enough. Outsourcing is not an option of choice or following a well-defined strategy and business model but rather a mechanism and necessity of pure survival. It is also symptomatic that clients looking for a Serbian company to do outsourcing do not ask for a specific reference list of a company. Instead they ask for CVs of all personnel and choose programmers on their own, which is also kind of a constraint for a company to build its image and profile as well as its field specialisation(s).

Serbian companies aiming to develop their own product are in need of additional capital on all the levels of the business cycle: from patenting the product, through market entry and finely maintaining the stability of the company.

- It takes about 5-7 years, sufficient funds provided, to prepare a company for IPO.
- About 20 people/programmers are needed to work the development of a new product.
- Companies such as DMS and Typhoon are already successful examples of Serbian companies developing and internationalize their own products.

C. EDUCATION AND HUMAN RESOURCE DEVELOPMENT

This chapter provides the following information:

- An overview of ICT labor market in Serbia
- ICT and high education in Serbia
- Cooperation between Universities and the Private Sector
- ICT and vocational trainings
- Available skills and skills gaps

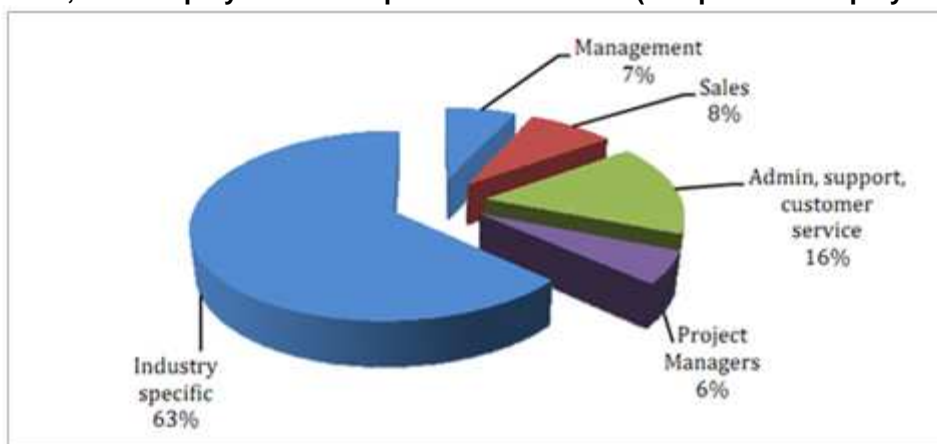
An overview of ICT labor market in Serbia

As discussed earlier, it is very difficult to determine the number of employees in the ICT/IT sector. If telecommunications sub-sector is included, ICT companies employ about 60-70,000 people. It is similar with the identification of IT experts – estimation goes from 5,000 (UNDP 2010, p.278) through 10,000 (Bednarik 2010, SIEPA 2009) and up to 12,193 IT experts (MINECO 2010).

According to Skills Gaps Study which was done by USAID in 2008 technical skills are strong and stable (software development, hardware design, IT services and system integration), with total number of graduates in the technical areas relevant to ICT being 26,963 in 2005.¹⁸

The same study shows that in the IT companies surveyed 63% employees are industry specific, while remaining 37% are in managerial and administrative positions. Some 21% employees are in general management positions, project managers and sales.

Chart No.10: ICT, % of employees in all reported accusations (sample 1122 employees)¹⁹



Source: USAID

It should be also acknowledged that the number of marketing and sales managers is very low (according to USAID only 1%), although these positions are recognized by experts and local companies as very important for future development and growth.

When it comes to the **demand and supply side of labor market** the situation might appear to be strange at the first glance. On the one hand there is a significant demand for programmers, at the same time there is quite a number of unemployed programmers. The explanation for this lays in the fact that the programmers currently looking for jobs often do not have characteristic or specific knowledge and expertise needed in IT companies. Out of the 250 IT graduates graduating from the University of Novi Sad only 30 to 40 are immediately employable due to missing practical skills and knowledge. Usually it takes about six months to train an IT graduate to be able to do junior work/tasks and one or two years to enable him/her to be a qualified programmer. This means that one of the experienced programmers has to be involved in mentoring and training such a new person and dedicate to him/her a high amount of

¹⁸Skills Gaps Analysis, in the IT, Film Production and Education Sectors of the Serbian Economy; USAID 2008

¹⁹ Skills Gaps Analysis in the IT, Film Production and Education Sector of the Serbian Economy; USAID 2008; page 21

time, which is causing huge cost effects (together with other issues like taxation etc.). Since most of the IT companies in Serbia are micro or small it's understandable that it's hard for them to afford this.

Yet the yearly inflow of (qualified) IT graduates is not sufficient which creates a constant lack of programmers. Having in mind the size of Serbia and interest that young people are showing in IT related studies it cannot be expected that number of IT graduates will significantly increase in the years to come if no incentives are set in this direction.

One of the problems Serbia is constantly facing is the **brain drain** especially when it comes to graduates from the ICT related fields of studies. Young talented professionals have been since 1990s leaving country, going to USA and Western Europe countries, Canada and Australia. According to Eurostat data from 2006 (OECD 2009, p.164), young people from Serbia mostly go to study in Germany, followed by Hungary, Austria and Italy. Though this trend has declined it still remains one of the biggest problems. There is no accurate data on how many young graduates and ICT professionals leave Serbia each year. According to media coverage, 5 out of the 30 best students leave the country right after the graduation. In the case of some faculties (e.g. Physics), this ratio is 10 out of 12 graduates.²⁰ Young graduates either leave the country for employment or, more often, for continuing education.

ICT and High Education in Serbia

The stakeholder analysis identified 10 universities with higher-education programmes in the field of ICT. On top of this, there are an unidentified number of colleges that also produce young professionals in the ICT field. However, it is very difficult to determine annual inflow of the ICT graduates in Serbia. While the UNDP argues that there are about 1,000 ICT graduates per year at the University of Belgrade, which makes 7% of all graduates at that University (UNDP 2010, p.278, OECD 2009, p.197), Mineco claims there are about 2,000 graduates in the whole of Serbia. SIEPA has compiled a table of the ICT graduates per major cities in Serbia for 2007, which probably gives the most accurate overview in this regard.

Table No.5: ICT Graduates from Colleges and Universities in Serbia in 2007:

Field	Belgrade	Nis	Novi Sad	Kragujevac	Else-where	Total No of Graduates
IT	1,288	195	391	120	449	2,443
Electrical engineering	917	121	294	82	191	1,605
Mechanical engineering	329	124	241	134	383	1,211
Mathematics	154	29	36	23	15	257
Total	2,688	469	962	359	1,038	5,516

Source: SIEPA 2010, based on the data from the Statistical Office of the Republic of Serbia

According to MINECO figures, employability in the IT sector increased in 2009 by 23%, which means 2,300 young graduates got a job in that year. This figure is expected to grow in the following years. However, it is clear that Serbian universities do not produce enough graduates to satisfy market needs. In addition, JISA has presented data showing that per capita investment in IT education in Serbia is six times less than in Croatia and Slovenia and 30-90 times less than in EU Countries.²¹ Therefore, there is a need for new policy incentives, which will target more educated graduates in the ICT field.

²⁰ Source: B92 media coverage from October 4, 2010, on the conference between Deputy Prime Minister and the group of best students of the Belgrade University. See (in Serbian) http://www.b92.net/biz/vesti/srbija.php?yyyy=2010&mm=10&dd=04&nav_id=462900, last accessed on September 20, 2010.

²¹ Data presented by JICA at the Conference on role of Media in Development of Information Society, organized at the Serbian Chamber of Commerce in 2008. For more information, please visit the news coverage at the website of SeeCult: www.seecult.org/node/30642, last visited, September 20, 2010.

One of the advantages of the Serbian education system is the high level in mathematics education. Since 1968, the students of the Mathematics Gymnasium in Belgrade have won 81 medals for mathematics, 17 for physics and 14 for IT sciences on World Knowledge (UNDP 2010, p.278).

The performance and quality of university education seems weak, however. The Serbian education system provides graduates with a lack of problem-solving skills and entrepreneurial spirit, excessive theoretical knowledge and inadequate general and specific technical skills (OECD 2009). According to a study from 2006 at the School of Electrical Engineering, only 11% of students graduated on time and the average length of studies were around eight years. Nevertheless, it is fair to say that university education has been under reform in the past few years, introducing new curricula in line with the Bologna Accords.

Cooperation between Universities and the Private Sector

There is no tradition of cooperation between universities and the private sector in Serbia. In the past, universities behaved in an autistic manner, having little concern on market demands for changing curricula and introducing new courses. Bearing in mind the high degree of development within the ICT sector, this created a situation in which private sector entities became more advanced in the field of ICT/IT than universities.

However, it is fair to state that the situation has been changing over the last few years. Successful cooperation between companies and universities has been reported by the Faculty of Technical Sciences at Novi Sad University and at the group of faculties of technical sciences of the University of Belgrade, which created a Business-Technology Incubator for start-up companies in the ICT field. This cooperation should be strengthened by creation of internship opportunities for students and their recognitions by the universities.

ICT and vocational trainings

There is a need for further vocational training of new graduates before they start doing a 'real' job. According to the results of the Regional Capability Survey presented in the OECD report, only 13.3% of enterprises provided training to their IT experts, and 10.1% of these did so within their own firms (OECD 2009, p.197). However, qualitative interviews with Serbian companies organised within this assignment has shown that the majority of companies organise on-the-job trainings for recent graduates in a form of mentoring and coaching from senior professionals. Nevertheless, this approach increases the cost of recent graduates entering the job market, especially in the case of micro and small firms, which represent a majority in the IT Sector.

Usually, micro and small enterprises have neither human nor financial resources to invest in additional training of new staff. Bearing in mind the shortage of ICT/IT graduates in the Serbian market, they become uncompetitive in this regard, since they don't have the means to compete for good-quality graduates with large IT firms and companies from other sectors such as banks, other financial institutions, public sector agencies, etc.

In terms of vocational institutions that provide informal training and certification for technical skills, the most prominent are Microsoft and Cisco.

Microsoft in Serbia has two major educational programmes: (1) academic programme (MSDN Academic Alliance and IT academy) for accredited educational institutions in Serbia and (2) partner in learning programme for individuals and educational institutions providing trainings for teachers, instructional resources and e-learning for teachers. IT Academy is a programme that enables accredited local educational institutions to organise high-level programmes on the most recent Microsoft technologies. The programme of the IT academy prepares students for jobs such as: Network Administrators, Technical support, Programmers, designers and programmers for MS office, and also for receiving Microsoft certificates. In total five faculties and one University are members of the Microsoft IT academy.

CISCO Entrepreneurship Institute (CEI) in Serbia²² and Southeast Europe has been established at the Faculty of Technical Sciences at the University in Novi Sad, as a result of cooperation between CISCO, the USAID Competitiveness Project and the Faculty. The centre delivers CISCO-certified

²² More about CISCO in Serbia might be seen at www.cisco.com/web/YU/learning_events/index.html, last accessed on September 20, 2010.

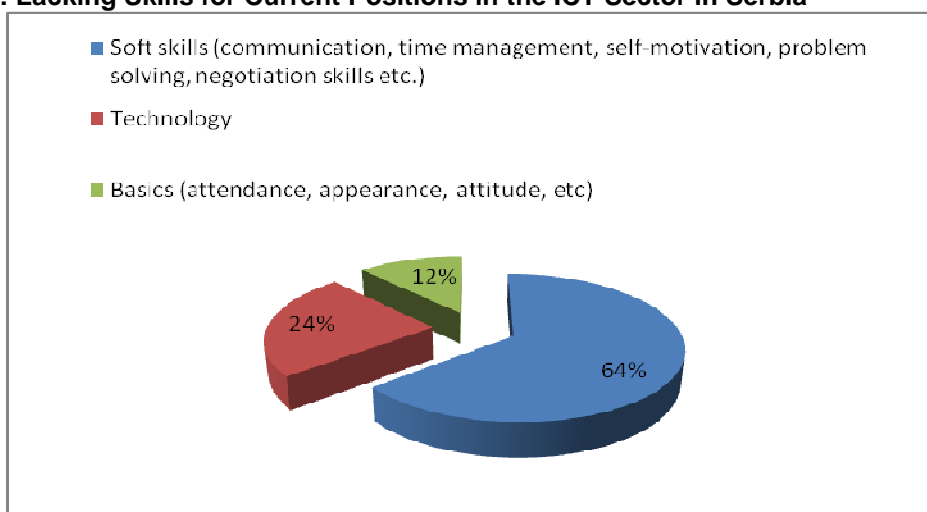
entrepreneurship education on a commercial basis to Serbian entrepreneurs, SMEs and public sector employees in the following areas: Starting a Business, Growing a Business, and Business and Public Service Improvement through ICT. The CEI also provides training and certificates in various programmes such as: IP Communications, Routing and Switching, Security, as well as training for technical staff including Curriculum Planning Service and access to comprehensive technical knowledge library.

Available skills and skills gaps

The OECD study concludes that strong technical knowledge, coupled with the development of soft skills and a deeper understanding of business processes and verticals²³, would give Serbia a leading position for attracting IT operations from abroad.

In 2008 USAID did a survey among Serbian companies on identifying skill gaps among ICT professionals. The survey identified that 64% of current workers lack soft skills, 24% technology skills, and 12% basic skills such as attitude, appearance, etc (USAID 2008). Among the soft skills, the most common shortcomings are in communication, problem solving, time management and negotiation. The Study recommends that ICT companies undertake soft skills training over the above-mentioned skills, including project management, conflict and change management skills.

Chart No.11: Lacking Skills for Current Positions in the ICT Sector in Serbia²⁴



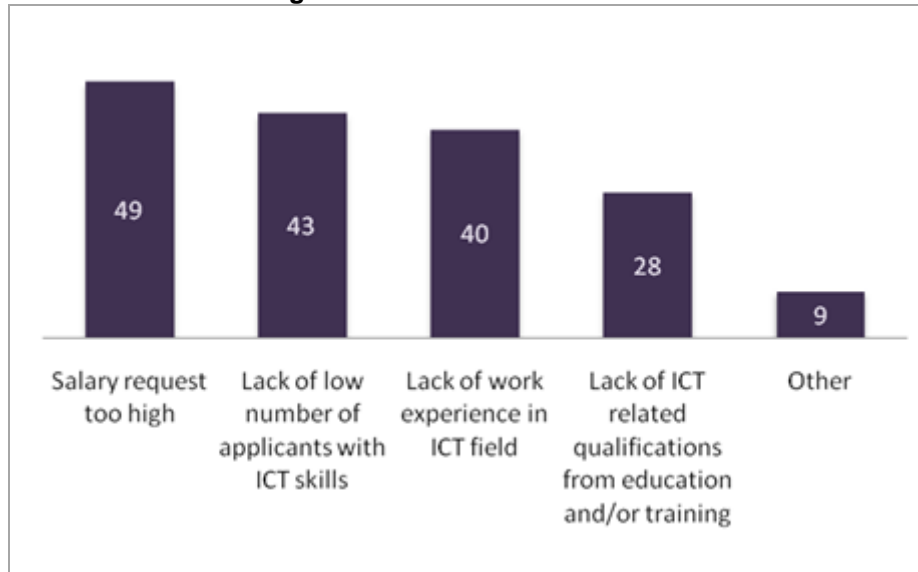
Source: USAID

Serbian IT experts generally have a good command of the English language, having significant results in TOEFL tests, which are better than most other countries of the Western Balkans, but still weaker than in Croatia, Bulgaria and Romania (OECD 2009). Beside, Serbia in general has the highest percentage of English speaking working population (49%) in the SEE region (Bednarik 2010).

Command of other languages (German and French) is significantly weaker than English. The OECD Study also claims the necessity for an improvement of cultural understanding and 'soft skills', despite strong ties with Western Europe through many overseas study programmes. Similar are the technical, 'hard' skills, which are growing but still limited in terms of software development and back office services.

²³ A vertical market, or often referred to simply as a "verticals", is a group of similar businesses and customers that engage in trade based on specific and specialized needs. Often, participants in a vertical market are very limited to a subset of a larger industry (a niche market).

²⁴ Skills Gaps Analysis in the IT, Film Production and Education Sector of the Serbian Economy; USAID 2008; page 24

Chart No.12: Obstacles to Obtaining Skilled ICT Workers in Serbia²⁵

Source: OECD 2009, based on the OECD Investment Compact 2007

In discussions about improving internal human capital within Business Process and Information Technology Outsourcing (BPTO) companies, OECD identifies two types of activities: 1) maximising nearshoring advantages and 2) improving “hard skills” (OECD 2009). In maximising the advantages of nearshoring, two particular types of soft skills are important:

- Language skills – fluency in English is almost always a requirement, other languages are a plus;
- Cultural understanding and 'soft skills', since communication is much more than just speaking the same language.

Besides this, continuous improvement of so-called 'hard skills' (i.e. technical, analytical and problem solving skills, together with relevant subject knowledge) is also necessary. It is important to bear in mind that the skills acquired only a few years earlier may no longer be relevant.

²⁵ Sector Specific Sources of Competitiveness in the Western Balkans; OECD 2009; page 200

D. RESEARCH AND DEVELOPMENT

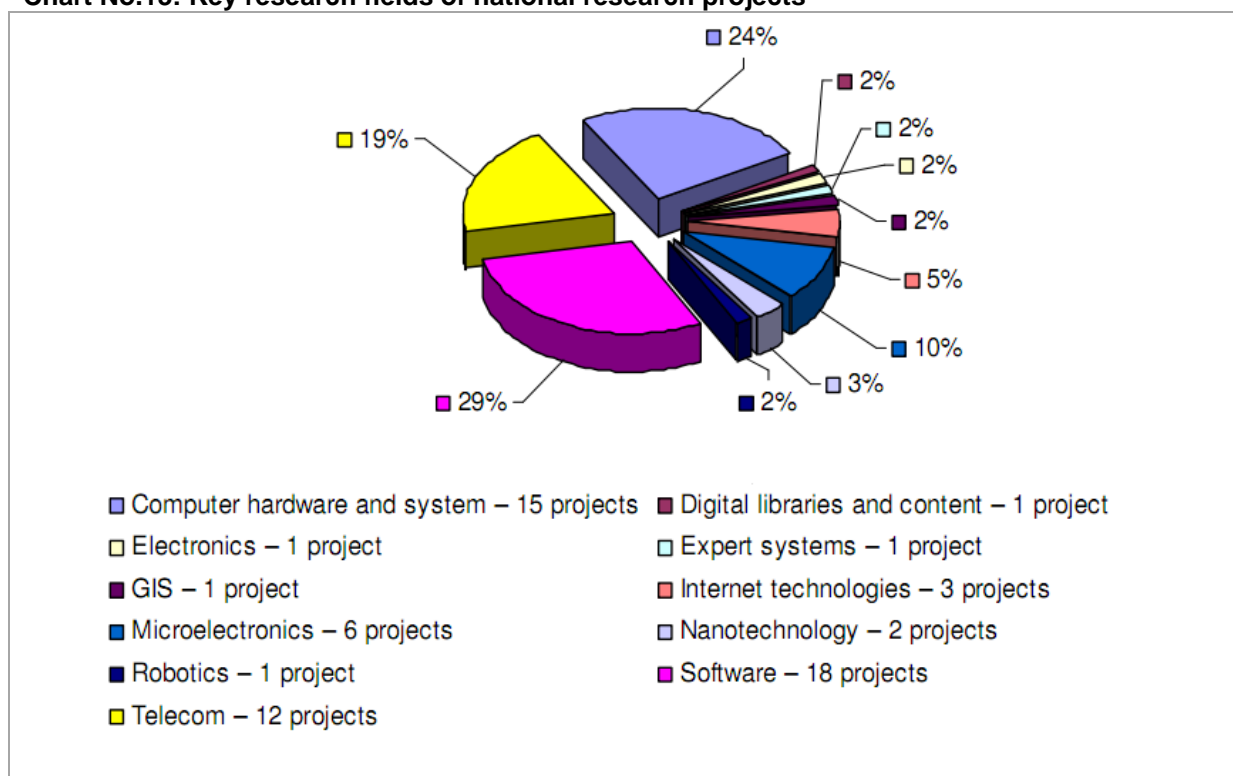
This chapter provides the following information:

- Current situation regarding R&D in Serbia, in general and ICT related
- Government R&D policy
- EU support dimension

Current situation

Serbia has limited capacity for research and development since it lacks critical mass in any field of research. However, in recent years there have been significant positive developments in this regard which might contribute to significant improvements in this sphere.

Chart No.13: Key research fields of national research projects²⁶



Source: SCORE

Research in Serbia has been almost exclusively funded by public funds. Research in ICT is pursued in a few public institutes and faculties where capacity for R&D, and even capacity in manufacturing are reduced compared to the past. That necessitates consolidation of their infrastructure and recruitment of research staff. The most important ICT research centre is the Institute 'Mihajlo Pupin', which has good capacities in this field, particularly in the embedded and motherboard design industries.

In the last few years, cooperation between universities and research centres with enterprises has been increased since new mechanisms for cooperation were introduced through ICT clusters and influential companies and individuals. Technology centres and business incubators have been also useful in this regard. However, often ICT companies are more technologically advanced than universities and research centres, which undermine their attempts at cooperation. In that regard, cooperation between these parties is rather focused on gaining access to university graduates (in the case of universities) and certain researchers (in the case of research centres) and technology spin-offs and know-how transfers.

²⁶ The ICT Research Environment in Serbia, SCORE Project 2010; page 8

The majority of Serbian ICT companies are too small to be engaged in research. However, their involvement in development of new innovative products is much more significant. In regard to the development of new products, companies usually create development teams within their own human resources. They rarely cooperate with other peers from the ICT sector. However, ICT firms are keen to cooperate with companies from other sectors that are operating in the area related to the targeted product. As discussed earlier, cooperation with the universities and research centres is limited. If there is a need for cooperation, companies prefer to sign an individual contract with the researcher or professor at the university than a contract with the whole institution.

In September 2005, Microsoft established the Development Centre in Belgrade. It started as a small operation focused exclusively on projects related to Tablet PC technology under the name Tablet PC Development Extension. Recently the Centre has intensified efforts on Tablet PC projects as well as taken on new projects unrelated to Tablet PC. In order to reflect the broader scope of projects and the growth of the staff, the name has changed to Microsoft Development Centre Serbia (MDCS)²⁷.

The main MDCS projects are:

- Language Handwriting Recogniser “Factory”;
- Handwriting Recognisers for Special 2D Domains;
- Windows Live Components;
- SQL Server Spatial Libraries.

Also, alongside building of the earlier mentioned IT Park in Indjija, there are numerous ongoing initiatives for establishing scientific-technology parks in Belgrade, Novi Sad, Nis and Kragujevac. There is also a technology park in Vrsac. Those scientific-technology parks are designed to encourage public-private synergy between universities and the business sector, often supported by local self-government and line ministries. Beside, they are also established with the aim of creating a good base for innovations in the field of advanced technologies, including ICT. However, as previously stated, due to insufficient flow of ICT graduates per annum there may be an issue of labour market disturbances. According to the information received during the interviews, companies have a strategic goal to locate within scientific-technology parks and by that to have the access to the incoming fresh ICT graduates. This is especially visible in Novi Sad where companies show quite a significant interest in occupying the part although offered tenancy conditions might be considered as expensive to Serbian conditions.

Government policy

The Serbian government has demonstrated serious commitments towards creating a favourable R&D platform in the future. Legislation of science, education and innovation development has been advanced. Important innovation in laws concerning both education and science has introduced the mandatory process of accreditation of universities and institutes as knowledge and research providers. Progress has also been made with intellectual property legislation by adopting five new laws and by setting up the Intellectual Property Office of Serbia.

The most significant advancement in the field of research and development is the adoption of the **Strategy for Scientific and Technological Development of the Republic of Serbia** for the period 2010-2015. The Strategy has a goal to reach 1% of GDP for science by 2014, not counting infrastructure investments. At the moment, investments in science in Serbia do not exceed 0.3% of GDP. Furthermore, the Strategy aims to increase and diversify Research and Development expenditure, as well as investing €300 million in infrastructure.

Within the Strategy, seven **national priorities** have been identified, among them information and communication technologies as well. The priorities are the following:

- Biomedicine and human health;
- New materials and nano-science;
- Environmental protection and countering climate change;
- Agriculture and food;
- Energy and energy efficiency;
- Information and communication technologies (ICT);
- Improvement of decision-making processes and affirmation of national identity.

²⁷ More information on the MDCS is available on the website: www.microsoft.com/scg/mdcs/default.aspx, last visited on September 20, 2010.

The Strategy further delineates **research priorities for ICT** within the following areas:

- Installed electronic systems - manufacturing of equipment and software, modelling and optimisation of performances in real time, management and control
- Development and implementation of modern hardware and software solutions in embedded technology (new generations of signal processors and controllers, embedded operating systems) adapted for communication based on GR technology);
- Intelligence sensors - actuators and multi sensor systems - systems for surveillance and warning (meteorological, police, military and others); wireless communication networks for surveillance and control in industry, agriculture and ecology; control and monitoring of food production; medical instruments and sensors;
- Management and control of complex distribution systems - generation management and distribution of power (power electronics, automations and control); management of traffic, utility services, surveillance of environment, exploitation of wireless communications, GPS systems, multi sensor networks, satellite photos
- IT of libraries and digitalisation - computerisation of all library and archive stocks in Serbia, accessibility via internet, digitalisation of all publicly accessible property, presentation of all cultural and natural goods
- Telecommunication systems of broadband access and digital transmission - research, development, demo equipment and devices for fibreglass and wireless telecommunications, digital TV, multimedia facilities
- Radar and infrared identification and control systems, R&D security equipment for application in security areas, traffic, agriculture, medicine, analysis and processing of signals, recognition of shapes
- Expert systems
- Information security

The second important strategy paper in the field of ICT is the ***Strategy for the Development of an Information Society (2006)*** which underlined the importance of R&D in the field of ICT and development of ICT infrastructure, e-Government, e-Education, e-Health and e-Business.

Serbian scholars have made excellent progress in publishing papers in international peer-reviewed journals. In 2000 Serbian science was at the bottom of the European list of countries. In 2008 however, scholars from Serbia managed to surpass those in the neighbouring countries of Croatia and Bulgaria, and caught up with Slovenia on a number of published scientific papers. The majority of the papers were published in the field of technical and natural sciences, which makes a good scientific base for the ICT field.

EU Dimension of ICT R&D in Serbia

Serbia has been included in the Seventh Framework Programme (FP7) as an associated country since 2007. Serbia has also been included in FP5 (2 projects) and FP6 (19 projects)²⁸. Here is a list of some of the FP6 and FP7 projects in which Serbian research centres participate:

- Strengthening the Strategic Cooperation Between the EU and Western Balkan Region in the field of Information and Communication Technologies Research (SCORE)²⁹;
- Web4WeB³⁰ - Web technologies for Western Balkan Countries;
- West Balkan Research Directory³¹ - an online directory of Serbian ICT research organisations and their profiles;
- SEE-ERA.NET and its extension SEE-ERA.NET plus³², for integrating the Southeast European countries and their key communities into the European Research Area (ERA);
- IDEAL-IST.NET³³ - an international ICT partner search network with more than 60,000 contacts;
- WBC-INCO.NET³⁴ - coordination of research policies within Western Balkan countries.

²⁸ Overview of Serbian participation at FP6 and FP7 projects might be seen at the website <http://nauka.gov.rs/fp6/web-content/eng/participation.html>, last accessed on September 20, 2010.

²⁹ More about SCORE project might be read at www.score-project.eu, last visited on September 20, 2010.

³⁰ Web4WeB is the project with the mission to strengthen the West Balkan's research body, industry and service providers in one of the most important areas of current computer technology – Semantic Web. More information on the project might be read at www.web4web.org, last accessed on September 20, 2010.

³¹ More about the project might be seen at www.westbalkanresearch.net, last visited on September 20, 2010.

³² More about the SEE-ERA.NET to be seen on www.see-era.net/start.html and on SEE-ERA.NET plus to visit www.see-era.net/start.html, last accessed on September 20, 2010.

³³ More about the project might be seen at www.ideal-ist.net, last visited on September 20, 2010.

WINS-ICT “*Western Balkan Countries Inco-Net Support in the field of ICT*” is an initiative funded by the EC 7th Framework Programme for Research and Technological Development under the ICT theme of the Cooperation Programme. As a support action, WINS-ICT intends to strengthen cooperation between the EU and the Western Balkan countries by deepening the bi-regional strategic relations in the ICT field and promoting the participation of WB ICT researchers in FP 7.

The WINS-ICT portal aims also at becoming a key reference point as to targeted information on ICT research in the Western Balkan countries and the opportunities of collaboration within the 7th Framework programme. In this framework the WINS-ICT portal inherits and further deepens the work initiated by the SCORE portal³⁵ and acts in close cooperation with the WBC-INCO-NET and ICT-WEB-PROMS projects and related websites. The Serbian ICT Net cluster have recognised this need for further FP7 trainings by including trainings and information campaigns on matters dealing with EU funds like FP7, CIP etc. in their activity portfolio.

Above mentioned WINS-ICT initiative has recognised the driving forces in WB countries when it comes to R&D related to ICT, which is represented by the table below.

Table No.6: Regional ICT R&D Priorities (Legend: “A” stands for Attractiveness; “B” stands for Readiness)³⁶

ICT R&D	High A + High R	High A + Low R	High A + High R	High A + Low R	High A + High R	High A + Low R	High A + High R	High A + Low R	High A + High R	High A + Low R	High A + High R	High A + Low R
ICTs for Government and eGovernment	✓		✓		✓		✓		✓		✓	
ICTs for Enterprises & eBusiness	✓		✓		✓		✓		✓		✓	
Internet & Broadband Technologies	✓			✓	✓		✓			✓	✓	
Software Engineering		✓		✓	✓		✓		✓			✓
ICTs for Learning & eLearning	✓		✓		✓			✓	✓			✓
ICTs for Health & eHealth		✓	✓			✓		✓		✓		✓
Mobile Technologies					✓		✓				✓	
ICTs for Agriculture						✓		✓				✓
Digital Content & Digital Libraries		✓				✓				✓		✓
Distributed Systems	✓											✓
Embedded & Pervasive Systems								✓				✓
Network Technologies		✓									✓	
Knowledge Technologies						✓						✓

Source: SCORE

³⁴ More about the project might be seen at <http://wbc-inco.net/>, last visited on September 20, 2010.

³⁵ <http://www.score-project.eu/>

³⁶ Score project D7 Policy Paper “Shaping EU-Western Balkan co-operation in the field of ICT research & development in the period 2008-2013: Priorities and Recommendations”

E. NETWORKING AND COOPERATION

This chapter provides the following information:

- **Cooperation between the Serbian ICT companies**
- **Cooperation between the Serbian ICT companies and national public institutions**
- **Cooperation between the Serbian ICT companies and international development organisations**

Cooperation between the Serbian ICT companies

As discussed earlier, Serbian ICT companies have a **low degree of specialisation** since the majority of them are trying to be involved in a widespread set of business activities. This kind of business strategy limits networking and cooperation opportunities since the majority of companies are competing over the same market opportunities. However, in recent years, networking of companies has been increased, mostly related to the creation of consortia for tendering on public procurements and EU/internationally funded projects.

Companies are not keen on sharing resources and they are very protective in regard to innovative business ideas. In addition, there is a **limited degree of cooperation** in regard to reducing the cost of joint procurement of supplies and vocational training of human resources. Moreover, companies have a limited networking capacity in regard to lobbying and advocacy for policy changes among the decision makers at national, provincial and local level.

The field research has confirmed that ICT companies from Novi Sad have much stronger networking and cooperation potential compared with ones from Belgrade. Their relations with the university and provincial government are more substantial and dynamic than in Belgrade. As a result of this cooperation, private and public actors (including the university) from Novi Sad have initiated an initiative to set-up the Vojvodina ICT Cluster. Vojvodina ICT Cluster is an association of 23 companies from Novi Sad and other Vojvodina cities, established with the mission of enhancing development of the sector and advocating to policy makers.

In Belgrade is active **ICT Net Cluster**, which has been recently established by merging two cluster initiatives: Serbian Software Cluster (SSC) and Embedded.rs. SSC has been established in 2006 as a business association of 16 members (13 companies and 3 faculties) from Belgrade and Novi Sad. The cluster was established with the goal of providing various kinds of services to the software industry nationwide, though their activities are mostly Belgrade-based. SSC has been recognised as an important partner in IT/software industry development by all key stakeholders in Serbia, from national line ministries through international development organisations to the Chamber of Commerce, business associations and private sector companies. The cluster has served a good role of communication between government ministries and members of the clusters that include the most important software companies in Serbia. However, the cluster has failed to increase their membership to all other software companies, research centres and universities that are active in the field of their mission.

Embedded.rs gathered 10 companies in embedded sector, two universities and one research institute. Similar to the case of SSC, Embedded.rs in a short time became a good channel of communication between national line ministries and key private actors in the field of the embedded industry.

The **Vojvodina ICT Cluster** is a bottom-up initiative of twenty-three ICT companies from Vojvodina, the Faculty of Technical Sciences in Novi Sad, the development agency Alma Mons – Novi Sad, VIP (Vojvodina Investment Promotion Agency) and the Centre for Competitiveness and Cluster Development.

The Cluster has been formally registered in May 2010 and officially presented in public in October 2010. The Cluster has strategic goals focused to better networking, joint advocacy and marketing, applying for EU/international grants and joint tendering.

Vojvodina ICT Cluster members employ about 1,500 people and they reached annual turnover of 26 million Euros in 2009. In spite of the crisis, the cluster members realised annual growth of 23.4% (in 2008) and 30.61% (in 2009).

Although still in the phase of being established, Vojvodina ICT cluster will be one of the key players in the ICT field in Serbia, especially bearing in mind the number of ICT companies in Novi Sad and the importance of the Faculty of Technical Sciences in Novi Sad.

Recognising its potential GIZ is supporting the cluster in various ways: from advising in regard to strategy and cluster profile development, planning processes and implementation, marketing activities to financial support.

Cooperation between the Serbian ICT companies and national public institutions

The Serbian Chamber of Commerce also serves a good role in mobilising and networking ICT sector companies and professionals. The Chamber has good communication lines and potential for policy advocacy, which has been recognised by ICT companies. In cooperation with line ministries, SIEPA and business and professional organisations, the Chamber is active in organising conferences, forums, international and domestic fairs, vocational training and other events that serve the purpose of developing the ICT sector. The Chamber is also active in organising Business-to-Business (B2B) events, networking Serbian ICT companies with their peers from the Western Balkan region and abroad. The Chamber has developed good relationships with ICT companies in Montenegro and Croatia, and slightly less so with companies in Slovenia. However, the last B2B event organised by the Chamber attracted representatives from 27 Slovenian and 50 Serbian companies.

There are numerous other associations, mostly registered as non-governmental organisations, which support networking and policy dialogue in the field of ICT. Please see the stakeholder analysis for complete list of organizations active in mobilising ICT stakeholders and professionals.

The government of Serbia and line ministries, the Ministry of Telecommunications and Information Society (MTIS), the Ministry of Science and Technology Development (MSTD) and the Ministry of Economy and Regional Development (MERD) are active in supporting the ICT industry since all of them see this sector as one of the most prosperous within the Serbian economy.

In order to help the ICT sector in the years of crisis, the Government of Serbia adopted a bylaw that gives subvention loans for purchasing domestically produced hardware and software. So far there are data on the impact of those policies to the sector. However, it is clear there is a need for other policy interventions. For instance, in Romania and Bulgaria the Government supports the ICT sector by giving a salary tax exemption for ICT professionals. This has increased a net salary of the ICT professionals, which reduced their brain drain to Western EU countries. Since Serbia has problems with outflow of IT professionals, similar policy intervention might be recommended to the policy makers.

The Ministry of Telecommunications and Information Society (MTIS), being the line ministry in charge of regulating the ICT sector, is the most active in cooperation with companies, clusters and business associations active in the field. MTIS has initiated public-private dialogue through **the ICT forum**.

The forum is organised twice a year in the form of a joint consultative meeting between the government on one side and ICT companies, clusters, business associations and the Chamber of Commerce on the other. These forums are usually organised around specific topics that burden the sector (i.e. unfavourable and outdated export and import regulations, tax issues, etc). The forum is usually chaired by a minister, which gives additional weight to the whole event. However, in interviews with stakeholders, numerous issues have been identified that should be solved in order to strengthen the role of the forum in the future. Those issues have been grouped into the following:

- First, although high authorities within the line ministries are represented at the forum, outcomes in policy changes and policy development are limited. There is no clear agenda, action plan or a roadmap on how to solve problems identified at the forum. Monitoring mechanisms are also unclear;
- Second, civil servants from public administrations, including MTIS and other line ministries, at the medium or lower level do not have a sufficient level of decision-making power to impose policy changes. The vertical communication within Ministries is often an issue as well;

- Third, horizontal communication between different ministries and public sector entities is an issue that also affect the work of the ICT forum;
- Fourth, civil servants and policy makers lack specific and in-depth knowledge on the sector. There is a lack of assessment and policy analysis in the field. ICT sector statistics are also an issue;
- Fifth, organisation of the forum event and facilitation of the discussion seems to be insufficient. There is no calendar of the forum events, they are rather organised on an ad-hoc basis. Identification of the forum topics is also not clear;
- Sixth, the private sector lacks skills in identifying and articulating their strategic needs, since they are mostly oriented to solving contemporary short-term issues.

There is a need for project intervention with the goals of strengthening the role of the ICT Forum and advancing the capacity of policy makers, civil servants and private sector entities in many fields such as coordination, facilitation, cooperation, monitoring, amongst many others. It is also necessary to strengthened capacity for ICT policy analysis and policy assessments.

Creation of public-private partnerships is not well regulated by Laws. However, in recent years there are a few public-private partnerships in the creation of business incubators and technology parks, certification, international fair participation, cluster development, implementation of electronic signatures and e-Governance among many others.

Public-Private Partnerships (PPP) will be most frequent tool for enhancing economic development in Serbia in the future. However, there is a lack of capacity among civil servants and private sector agents in successful PPP design and implementation. Therefore, project intervention in developing soft skills for PPP will also be welcomed by ICT stakeholders.

Cooperation between the Serbian ICT companies and international development organisations

The ICT sector has been recognised as a sector for project intervention by development agencies such as GIZ or USAID. Through the WBF project of increasing competitiveness of SMEs in Serbia, GTZ (now GIZ) recognised ICT as one of the sectors for their project interventions. Under their project activities, **GTZ/WBF** has provided support to participation at international fairs, CMMI certification and standardisation, capacity-building training, organisation of B2B events and study tours among many others. GTZ/WBF has channelled their support to ICT through the Serbian Software Cluster and subsequently through Embedded.rs also. Both clusters have been supported with institutional grants and capacity-building activities.

USAID's Competitiveness Project is the second donor intervention that directly targets the ICT Sector in Serbia. The project started with the assessment of needs in the ICT sector (USAID 2007) and Skills-Gap Analysis. Based on the recommendations from these two baseline documents, the project has identified four key activities: (1) training and certification in project management, (2) establishing the CISCO Entrepreneur Institute Training Centre, (3) expert promotion of the IT Sector, and (4) support to information technology.

EU SECEP supports ICT Clusters with institutional development and capacity-building activities in regard to strategic and action planning, implementation and monitoring.

The Fund for Open Society also runs an IT project with the following priorities: harmonisation of domestic IT policies within the Lisbon Agenda and the e-SEE Agenda; provision of the participation of all stakeholders and the public in decision-making processes related to the development of information and knowledge society; the use of ICT for the purpose of developing a knowledge society based on inclusion, rule of law, accountability, citizen participation, control of the public authorities and openness to differences³⁷.

³⁷ More about the project might be seen at www.fosserbia.org/programs/program.php?id=201, last visited on September 20, 2010.

F. CURRENT SITUATION, TRENDS AND POTENTIALS

This chapter provides the following information:

- **Current Situation in Serbia**
- **Global Trends**
- **German Key Market Trends and Figures**
- **Potentials**
 - **Specialization**
 - **Outsourcing**
 - **Standardization**
 - **IT Usage**
 - **IT and SMEs**
 - **Better networking with (foreign) partners**

The identification and evaluation of potentials for Serbian IT companies (with the specific focus on software and IT services developers and providers) necessarily has to be built on the description of the current situation in Serbia, the identification and analysis of global IT trends and the potentials arising from these trends for Serbian companies. In addition, as Germany is not just the largest ICT market in Europe but at the same time one of the key markets and partner for Serbian (IT) companies, the German situation is specifically outlined and assessed separately. Here a specific focus is on issues dealing with outsourcing.

Current Situation and Trends of the Serbian IT Market

On the global market, **IT companies from Serbia (SMEs and big ones alike) are engaged in the outsourcing** of writing programme codes, testing software and designing websites, but also in providing solutions in embedded industry. The main markets for outsourced industry are Germany, USA and the Netherlands. There is a trend among outsourcing companies to try and make their own products that might have a high export value on the foreign markets. However, so far only a few companies have been successful in this regard.

There is no unique pattern as to how Serbian companies enter foreign markets. There are a few common approaches on which it is worth elaborating further. However, it is not possible to provide an accurate assessment as to which of the presented models has had the most successful results. The models are the following:

- *Getting the job through contacts created at international fairs:* there are a number of companies who claim they got a job through contacts they created during their participation in ITC fairs. Usually they manage to get small contracts at first, thereafter developing trust and more serious contracts.
- *Getting the job through Serbian IT experts working abroad:* Serbian IT experts who work abroad have created a significant number of outsourcing companies in Serbia, or have helped Serbian companies to get contracts with foreign companies.
- *Getting the job through B2B events organised by the government, international development agencies or cluster associations:* ICT has been recognised as a sector with high export potential and in that regard, many governmental, international and other development organisations (including clusters) have been engaged in the increasing internationalisation of Serbian companies.
- *Getting the job through individual contacts, created under various circumstances:* In a number of cases Serbian companies have obtained international contracts based on their personal acquaintances overseas.

The **penetration of Serbian companies in global IT trends** can only be assessed as rather sporadic but definitely not called a massive phenomenon, mostly due to lack of specialization. So from a 2010 perspective the global technological trends have only a limited impact on the local SME software companies or are for many actors in the industry mere buzz words without substantial influence on actual business operations or strategies.

One of the most difficult issues of assessing the Serbian IT industry is the question of how much **sector/industry specific knowledge** is available that can be translated and “packed” into different software (applications). Their **success stories** of taking advantage of this knowledge such as the already mentioned companies (DMS, Execom, Typhoon etc.) that developed a business model based on their core competence, a unique expertise and experience in a certain (technical) field, and used their software only as a “wrap-up” and way to deliver and market this knowledge. For developing such a business model the (implementing) programmers are important but not essential. The knowledge, once developed and brought to a specific use, is not hard to “translate” into software.

Analysts of the Serbian ICT sector also face the directly connected problem of not being able to estimate the number of people employed by IT companies due to the fact that even managers of these IT companies could not give a clear answer, often stating that “they can employ as much people as needed”. Having in mind the above said (that programmers are not the key success factor) the necessary number of programmers are often hired from the free-lance market.

It is very important to emphasise **the lack of market intelligence on international markets** among Serbian ICT companies. Serbian companies do not have specific knowledge as to what could be the potential markets for their goods and services and how to access those markets.

In their study on the Belgrade Service Sector, FREN claimed that **productivity of ICT companies** was 68% higher than any other business sector in Serbia and more than three times higher than the Serbian average (FREN 2007). They also found that ICT companies have the highest average gross wage. However, exports in ICT are lower than expected, and “*if Serbia is to become a respectable off-shoring destination for software development, the ratio of services export to GDP in ICT sector has to be much higher*” (ibid, p.13).

The government, with its relevant ministries and public agencies, has started the project of developing **e-Government Services**. Based on a UNDP study, current status of implemented e-Government services is above the SEE average (UNDP 2010), with Serbia providing G2B at an average 56.67% (SEE average 50.54%) and G2C at 41.88% (SEE average: 37.06%). However, development of e-Government portals at the national and local level did not significantly improve market opportunities in Serbia, contrary to what the majority of local IT business had expected. As discussed above, the contracts for e-Government have been awarded to international and Belgrade-based companies, leaving local companies behind the market.

However, due to the economic crisis IT purchasing power of Serbian companies drastically declined in 2009, though there are signs of a slight recovery in 2010. Doing business in Serbia has also been troubled by low payment of contractual obligations and depths, which keeps high demand for money. Besides, most companies have a trouble with liquidity. The business sector is waiting for ‘miracle’ to happen and recover the economy. Whenever that happens, IT sector for sure will continue with two-digit annual growth.

The **market competition** is tough, very often non-transparent, with unclear rules of the game. It is very difficult for small IT companies to compete on the domestic market. Public procurement procedures are set up in a way to favour international and large local companies with strong references and significant lobby capacity. Small and medium sized companies have difficulties to develop good references thus their chances to get a job are slim. In order to win the contract, local companies create consortia and joint applications for tenders, which is quite a recent phenomenon; a few years ago, such cooperation between local companies would have been impossible to imagine.

The **inflow of FDI in Serbia** has twofold effects on developing market opportunities in Serbia. While at the beginning foreign companies came to in Serbia with already developed IT solutions, lately the trend of engaging local IT companies for developing IT solutions seems to have increased. This trend is especially visible in the banking sector.

It appears that the issue of the introduction and certification of **norms and standards** is currently of low significance of software companies as will be explained in more detail in the potential section.

Global ICT Market Trends

The **global ICT market regularly sets certain key market and IT technology trends** that can be translated into the specific business strategies and models of IT companies, big and SME alike.

Chart No.14: Key Global ICT Market Trends³⁸



Source: PAC

The listed market trends are complemented by **global (strategic) IT technology trends³⁹** which are among others: Advanced Analytics, Flash Memory, Biometry, Green IT and Efficiency, Cloud Computing, Virtualization, IT Security, e-Government, Mobile Applications, Web 2.0 Applications, Biometry, Embedded Systems, IT for Ageing Population and Social Computing.

German ICT Market Trends

The **key market trends and figures⁴⁰** for the **German ICT market** in the years between 2008 and 2010 can be summed up as follows:

- 3rd largest global ICT market and largest market in Europe with a market value of 145 billion EUR (in 2008) with an overall ICT market growth in 2008: 1.8% (stagnation estimated for 2009)
- ICT industry employs 843.000 people (in 2010)⁴¹ which turns into the 2nd biggest employment sector in Germany (behind the machinery industry but in front of for example the automotive and electronics industries)
- Growth drivers in 2008
 - Software: 5.3% (14.6 billion EUR, around 15.4 billion in 2009)
 - IT services: 6.3% (32.7 billion EUR)
- Many German companies see IT as a strategic instrument to improve efficiency and productivity

One particularly interesting figure is the **lack of IT specialists in Germany** which increased by 40% from 2009 to now 28.000⁴². Especially when this mere figure is further elaborated by a survey⁴³ during which

³⁸ Workshop materials: "IT Market Analysis, Germany"; GOPA Consultants 2009

³⁹ The list of trends varies in details but the listed technologies are mainly repeated through most studies done by Gartner, BITKOM, GULP etc.

⁴⁰ In the following trends and figures are evaluated according to GTZ workshop material (IT Market Analysis Germany) provided by Lucas von Zallinger (GOPA), 2009 and the survey and studies listed therein if not stated otherwise

⁴¹ BITKOM press release 19.10.2010

⁴² BITKOM press release 19.10.2010

⁴³ GTZ workshop material (IT Market Analysis Germany) provided by Lucas von Zallinger (GOPA), 2009

IT companies were asked for which positions it is particularly difficult to find qualified IT specialists. 46% of the respondents answered “software development” followed by 23% consulting.

According to a recent survey conducted by Bitkom five **technology trends** can be identified within the German IT Industry⁴⁴:

- **Cloud Computing and Virtualization** - Due to the financial crisis outsourcing, cost minimizing and resource saving have been gaining popularity. Cloud computing has become the in-phrase and a new approach to saving IT-capacities and increasing flexibility. Also on the rise are so called BI Software systems, enabling improved analyses of economic situations and processes.
- **Mobile Internet Usage** - A decrease of costs for mobile internet usage in Western Europe and the spread of smart phones has enabled the app-explosion and an increasing shift from stationary applications to mobile usage in the business and private world. Mobile data services are the fastest growing segment within the telecommunications services market. In this context, GPS Mapping and Portable Navigation Devices are also in demand and on the rise.
- **Green IT or E-Energy** - This includes energy saving trends such as E-Energy und Smart Grids and Smart Meters.
- **IT Security Data** - Security and protection as well as protection of data privacy remain important topics in the IT world and are facing new challenges due to increased outsourcing of processes, decentralized working structures and cloud computing solutions.
- **Enterprise 2.0** - Not just a trend topic but a serious discussion is taking place concerning the use of social media and Web 2.0 tools in enterprises, including new marketing and production mechanisms.

Key market trends and figures for the **German software market** can be summed up as follows:

- General drivers of the software application market in Germany are SOA, SaaS, ERP, CRM, BI, ECM and SCM.
- Vertical market drivers are: health, financial services, automotive
- Distinctive market feature: importance of SMEs (demand and supply side)
- ERP software
 - Next generation ERP packages are expected to increase demand from SMEs and to a lesser extent from large enterprises
 - Non-SAP products mostly used among SMEs as well as in areas where industry specific functionality is required
 - Large number of specialized local suppliers providing specialized ERP products for specific manufacturing sectors
- CRM software
 - Projected market value in 2010: € 2.16 billion
 - Growth vertical market drivers: telecommunication, banking, insurance, retail
 - Strongly increasing demand from SMEs
 - Financial crisis is likely to have a positive effect on demand for CRM applications

Key figures and market trends for the **German IT services market** can be summed up as follows:

- Out of the total IT services market value of 34.9 million EUR (in 2009) about 14.8 million EUR are generated by outsourcing services (increase of 8.3% from 2008)
- Growth drivers are
 - Outsourcing: 41% market share
 - Migration of ERP packages to next generation platforms
 - Projects concerning compliance & enterprise information integration (BI, ECM)
- Main customers: manufacturing industry, banks, insurances, public sector (eGovernment)
- Impact of increasing competition and cost pressure
 - industrialization of IT services (standardization, modularization, ITIL etc.)
 - increasing usage of outsourcing and offshoring (though some market observers see the peak already reached and markets declining)
- Standardization of technologies and processes will lead to stronger specialization and modularization within the IT services value chain - consequence: big IT service providers “outsource outsourcing”

⁴⁴ GTZ Report on CeBIT participation provided by Geraldine de Bastion (newthinking communications GmbH), March 2010

- IT service providers are trying to develop the SME market segment

Key figures and market trends for the German outsourcing (offshoring, nearshoring) market can be summed up as follows:

Outsourcing in general

- Outsourcing market volume around 13.7 billion EUR (in 2008), therefore outsourcing likely to remain biggest and fastest growing market segment with a market volume 14.6 billion EUR (estimated for 2009) and a growth rate of approx. 7%
- Growth drivers are IT infrastructure outsourcing (servers, networks, storage, data base systems), application outsourcing (web applications, ERP, help desk, CRM) and SMEs in general (especially niche market IT security services)
- Cost reduction, resources/skills, concentration on core competence and flexibility are the main motivations for outsourcing
- Trend towards smaller and shorter projects (less “mega deals”) and price erosion due to intense competition
- Average rates (per hour) for German IT freelancers in mid-2008 range from 66 EUR (software developer) and 75 EUR (consultant) to 78 EUR (project leader)
- Most sought-after skills (in mid-2008) are
 - System software: Windows, Linux, Unix, Solaris, AIX
 - Programming languages: Java, SQL, C/C++, ABAP4, C#, HTML, XML
 - SAP Modules: Basis, SD, BW, CO, FI
 - Database technologies: Oracle, DB2, SQL-server, MySQL, MS-Access
 - Open source programming: Linus, Apache, MySQL and PHP
 - ERP/CRM systems: SAP, Siebel, PeopleSoft, Navision, Oracle applications
- Most sought-after soft skills (apart from a stronger emphasis on university degrees in general) are project management, social and communicational skills like languages (English, German), cross-cultural skills

Offshoring (including Nearshoring)

- German nearshoring market (in 2006) showed a market share by country of
 - Belarus/Russia/Ukraine 32%
 - Czech Republic/Hungary/Poland/Slovakia 29%
 - Balkan 15%
 - Bulgaria/Romania 15%
 - Baltic States 9%
- Demand for offshoring is based on application development, maintenance, call center, customer service and desktop management
- Growth drivers in vertical markets are financial services (estimated 12.8% growth in demand until 2011), telecommunications, automotive, electronics and IT
- Data entry, web-based applications, IT services, custom software development, customization of standard software are named as some of the most suitable tasks for offshoring

Evaluation of selected (market) potentials for Serbian software companies

Potential - Specialization

Being in a service industry, IT companies would benefit from specialisation, either in a particular area (vertical specialisation) or in a particular function (horizontal specialisation). Service-providing firms that are more specialised have greater control in setting their own prices for the services they offer. The more specialised the product, either horizontally or vertically, the fewer the number of actors that will be able to provide it, increasing service providers' scope to set their own billing rates. To increase the impact of having more control over prices, firms with particular expertise and specialisation in an area will probably also produce higher quality services (OECD 2009, p.157).

Specialisation can make it easier for a new entrant in the IT market to build an international reputation. Not only does specialisation facilitate meeting relevant clients, but it also allows a firm to develop a reputation in a niche area that could attract future customers.

In the IT sector, software developers in particular are sensitive to specialisation, since they need in-depth knowledge of the processes and dynamics specific to each industry. The importance of sector

specialisation to the software services segment is also related to positive spillover with respect to economic growth and productivity. This is true not only for the economy overall, but also at the level of individual firms. Among other positive effects, OECD empirical research showed that IT stimulates increases in labour productivity and helps firms to improve overall efficiency in all economic sectors. As demonstrated by experience in OECD countries (notably the US and Scandinavian countries), investment in IT research, both public and private, unleashes the innovation potential not only of the IT segment itself, but also of manufacturing and service industries, e.g. automotive, textile, energy, environmental technologies, telecommunications and tourism (OECD 2009).

Lack of specialisation among Serbian IT companies has been recognised as a big issue. The Serbian market is not big enough so IT companies do not have the incentive to specialise in certain areas. In order to survive they need to cover a broad scope of actions. Many if not most of the micro and SME companies tend to take the approach of being able to perform any kind of activity, though some of them they might be doing it for the first time. Moreover, there is no local offer of human resources with specialisation in particular areas since most of the IT professionals have a broad expertise. If companies need professionals with specialisation in certain fields, they would rather train some of their existent staff than engage external professionals or companies with the specialisation in the required field.

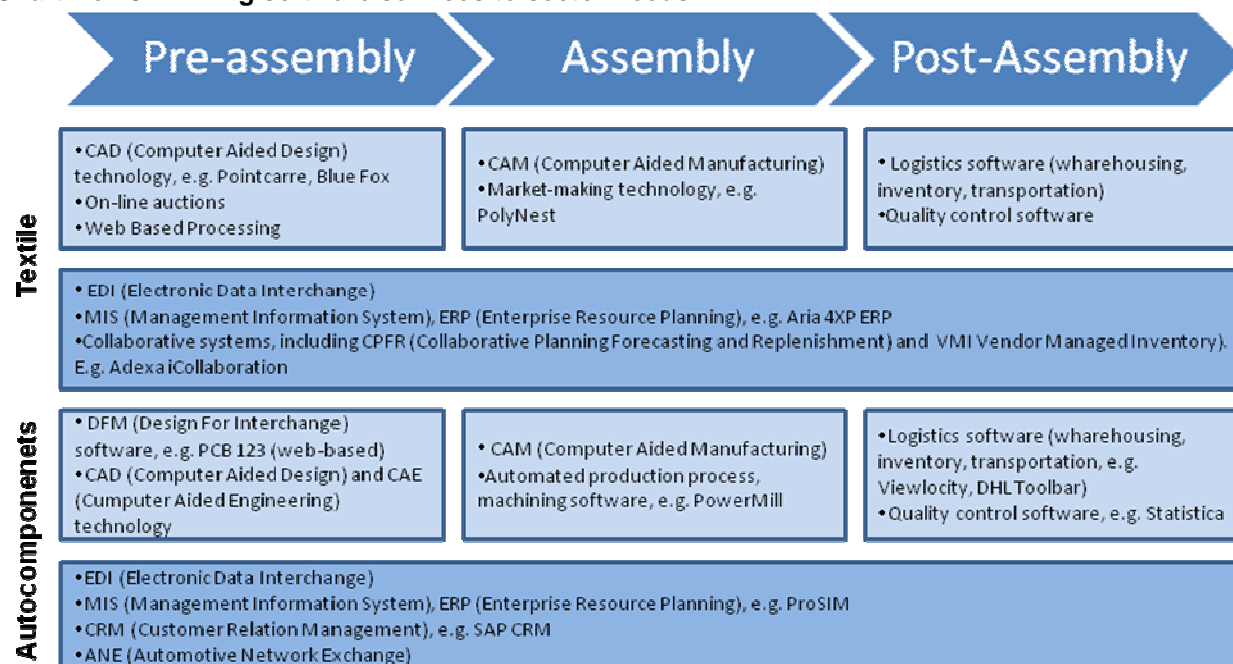
The specific significance of the free-lance market would have to be further examined in this context. This group provides on the one hand an unknown number of readily available skills and expertise; on the other hand it represents a large group of persons without a sound economic basis or chance of permanent employment, with all the difficulties coming with this status.

In order to fully evaluate and later exploit the potentials stemming from already available or to be improved industry, sector and process specific knowledge a clear understanding of this knowledge of Serbian IT companies has to be established. For the ICT clusters a cluster profile has to be developed respectively.

This understanding can then serve as the starting point for different potentials aiming in different directions and dimensions (local, regional and international):

- As the basis for the development of a company product as illustrated with the mentioned success stories of e.g. DMS. The software application in this context is built directly on the core competence of having excellent knowledge and understanding of an industry, its technology and processes.
- As the basis for industry or sector focussed initiatives by clusters and companies alike. When it comes to other sectors in Serbia, such as agriculture, apparel/textile, automotive etc. it appears a clear picture of their specific needs and demands referring to ICT products and services is often missing or incomplete on the IT companies' side. But also the awareness of managers and decision-makers in these industries as to how ICT can support their (business) processes has to be significantly increased.

The OECD in its 2009 study exemplarily shows the different aspects of such an approach for the apparel and auto component industry.

Chart No.15: Linking software services to sector needs⁴⁵

Source: OECD

The organisation of properly designed, prepared and implemented forums and exchanges between representatives of both sides could be one key instrument to address this matter. Taking into consideration GTZ/WBF sector expertise forums like “IT & Agriculture” and “IT & Automotive” are suggested examples.

- As a basis for the cluster initiatives to develop and strengthen their profile around certain technological innovations and “cross-innovation” where a cluster identifies other clusters/players with which it can co-operate outside the ICT sector but based on a common technological issue. The organisation of the suggested forums and exchanges, which are directly connected to the field of innovation and competitiveness development, is best located within the cluster initiatives.

After all, clusters are the primary actors when it comes to concentrate and transfer knowledge and specialization from the ICT sector to all others sectors and initiate innovation within and outside their own field.

- As a basis for gaining outsourcing contracts with local and international clients (see also the section on outsourcing as a potential). Here again a deep understanding of horizontal and vertical markets is a primary pre-condition.
- As a basis for the assessment of specific offers that can be made to SMEs (see also section on IT usage and IT & SMEs).

Potential - Outsourcing

For most of the Serbian IT companies (for micro and SMEs almost exclusively) outsourcing contracts are a simple and often sole “survival” strategy. Some of the reasons are explained in greater detail in the chapters and sections above, including company size, access to capital to develop own products in the short and medium term, low demand of local companies in other sectors, degree of specialization etc.

One can assume that in the timeframe of the coming ten years, taking an improved access to capital and IT professionals into account, outsourcing in the medium term remains one of the core pillars of services sold to local and foreign clients alike. Depending on how fast the ICT sector matures in Serbia and the region as such the market will more and more split between companies which do (especially software

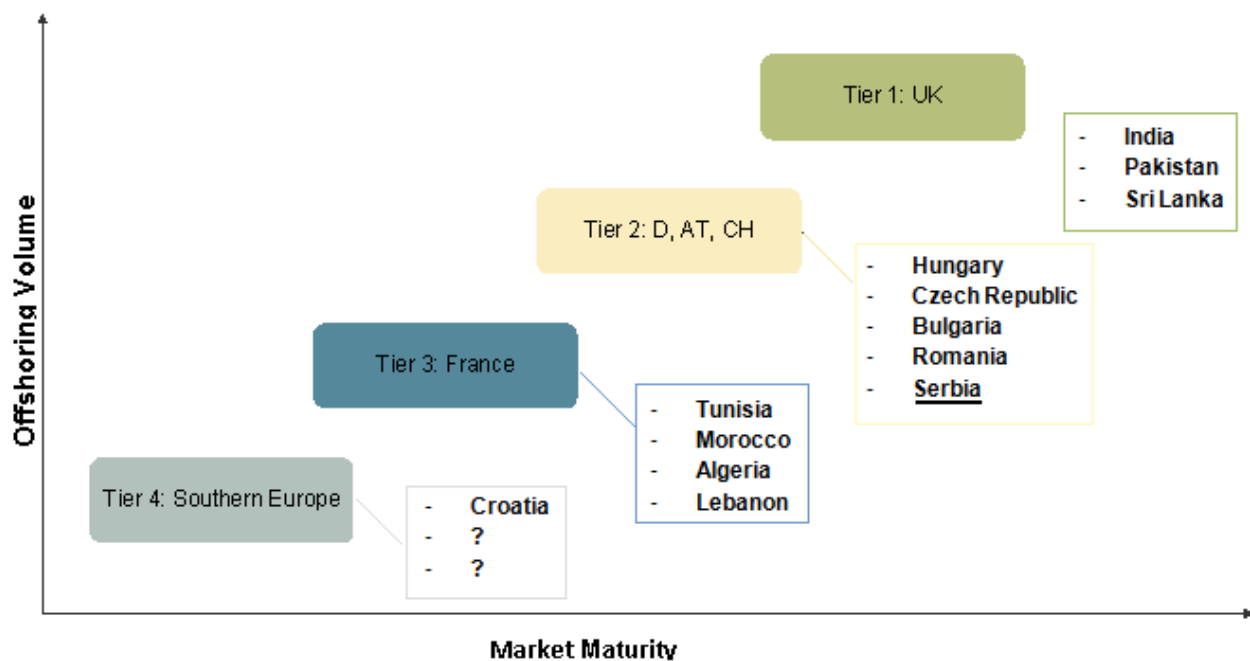
⁴⁵ Sector Specific Sources of Competitiveness in the Western Balkans; OECD 2009; page 160

development) outsourcing as a core or sole competence (specialized outsourcers). And those ones which are only occasionally work on outsourcing contracts.

Besides specialisation, there are several other obstacles to further development of the outsourcing market. One is the lack of references among Serbian companies which limits their abilities to access international market. Another one is the small number of software developers employed by the overwhelming number of companies (even if one includes the extra work-force potential) that doesn't allow Serbian competitors to compete for large international tenders and contracts which often ask for several hundred developers with specific expertise in one contract. In the long-run, as numbers of IT graduates won't significantly rise over the years, outsourcing from Serbia to Russia, India and China doesn't seem to be a far-fetched prospect.

Recalling the section on global and German market trends the (offshore outsourcing) potentials for Serbian companies become easily visible. In exploiting them Serbia can built on several factors including the preference of European companies for nearshoring to Eastern and South-eastern Europe due to distance and cultural issues, positive cost-benefit-ratio of relatively cheap but skilled labour (in combination with the lack of experts in some markets like Germany), strong language skill available and rising wages in some markets like India. The trend towards smaller and shorter projects (less "mega deals") is helping Serbian SMEs here additionally. The strong position and growth predictions can be seen in the following chart where Serbia is listed as a mature market with great market volumes.

Chart No.16: Intro-European offshoring market growth pattern⁴⁶



Source: GOPA

Yet another strong trend is important here as well. So far offshore/nearshore projects were mainly initiated by big companies. This has begun to change and more and more SMEs become interested in this strategy (cost pressure caused by the financial crisis and lack of own IT staff contribute here significantly). This adds up to a huge market potential for Serbian SMEs in Germany. Characteristics of this SME market are a focus of specific topics like SCM, CRM, BI, ERP, BPM, web applications etc., little of no experience with outsourcing/offshoring, preference for nearshoring and for working with SMEs and less competition as Indian and Russian companies focus on big players. The need for industry/sector specific knowledge and specialization remains once more a crucial factor.

Most of the just said appears to be translatable into the Serbian onshore SME market, though on a much lower level and longer time perspective. The exact potential of this onshore market from IT SMEs to local

⁴⁶ ⁴⁶ Workshop materials: "IT Market Analysis, Germany"; GOPA Consultants 2009

SMEs needs to be assessed. Some of the potential fields of activity are elaborated in the following sections of this chapter.

Potential - Standardisation

From the perspective of the year 2010 so far there has not been significant interest for certification or standardisation as stated by many actors in the stakeholder interviews. The Serbian software industry therefore has been engaged in obtaining CMMI certifications yet only on a very limited scale. Over the last few years, GTZ/WBF has been engaged in providing support to Serbian companies in introducing the necessary standards. More recently, EBRD's Business Advisory Services (BAS) Programme⁴⁷ in Serbia and SIEPA have been active in providing financial support to Serbian SMEs introducing the necessary standards.

The reason behind is probably not solely of a financial nature as IT companies e.g. can apply for grants from public bodies for the introduction and/or certification process as well as foreign donor organisation for this specific matter. Rather more (foreign) clients so far are not setting possession of such certifications as a strict precondition for contracting a company, this especially refers to micro and SME companies. They usually have their own, tailor-made ways for assessing if Serbian company in case is suitable for delivering a job.

Looking at the standardization issue from an outsourcing perspective quality management and standards/methodologies like CMMI, ISO 9001, ISO 27001, Six Sigma, ITIL etc. can be assumed growing significantly in importance as foreign partners' and clients' demand is likely to increase as elaborated earlier (keywords: progressing "industrialization" of IT services and "standardization of technologies and processes"). The Serbian ICT clusters recognized this need by including trainings on quality and standardization matters in their activity portfolio for the coming years.

The question of establishing an independent organisation (agency, laboratory etc.) for the certification of the Serbian origin of an IT product was therefore suggested as one possible topic in this context. This could be accomplished through a sector specific agency with a web-based platform where companies can register, login and upload source-code in order to receive 'Serbian SW' certification.

Summing up the anticipated increased demand coming from outsourcing clients and the cited example for an organisation evaluating software are just highlighting the assumed growing demand for quality infrastructure institutions, mechanisms and processes in the coming years.

Potential - IT Usage

One of the core potentials for Serbian IT companies remains to be the local market. The Serbian economy is still under transition, with outdated production lines that should be replaced with new technologies. IT solutions are also necessary for increasing efficiency in management. For instance, only 67.50% of Serbian companies that have an Internet connection have their own company website and only 11.50% of companies use Enterprise Resource Planning (ERP), mostly they are large companies (43.1%). Use of Customer Relationship Management (CRM) systems among Serbian companies is even weaker, only 8.5%. These figures clearly indicate low penetration of IT into Serbian companies.

Yet at the same time the Serbian IT industry is unfortunately not well-connected with the Serbian economy. Although the Serbian economy currently has great difficulties to survive the economic crisis, there is good market potential for doing business in the future. However, IT companies in Serbia should invest more time in getting specific knowledge about the economy in Serbia, and by that to position themselves for future opportunities. Furthermore, IT companies should help the technologically outdated Serbian industry with solutions that might increase productivity, innovation and competitiveness on the international and domestic market.

Potential - IT & SMEs

Like elaborated earlier the overall the Serbian IT market is dominated by micro and SME companies which could also be said for the Serbian economy as such (around 99%). The same situation refers to the Germany as over 95% of the companies are SME and most other countries in the world. While this study

⁴⁷ More information on EBRD BAS Programme is available at <http://en.bas-serbia.org/>, last accessed on September 20, 2010.

was drafted the Serbian Chamber of Commerce was working on a broad study on the IT usage in Serbian SMEs which will provide further valuable insights into the current situation and perspectives.

It has been shown in earlier chapters that especially the outsourcing market provides (growing) opportunities for SMEs in many perspectives (increasing demand by SMEs, specialization on SMEs needs, largely untapped market potential etc.) coming from outside of Serbia (regional and international dimension). At the same time the questions of how to turn the needs and deficits of Serbian SMEs into potentials for Serbian IT companies is a promising perspective from within Serbia (local dimension).

Potential - Better networking with (foreign) partners

This potential is already substantially discussed and assessed in earlier chapters (e.g. “Networking and Cooperation”) and sections of this chapter.

SWOT ANALYSIS

Strengths	Weaknesses
<ul style="list-style-type: none"> - Satisfying quality of human resources with competitive salaries; - Young, vibrant and emerging sector with active, innovative behaviour; - Strong capacity to adjust to new conditions and market demands; - Good command of English language within the sector. Solid knowledge of other languages as well; - ICT infrastructure improvement; - Proximity advantages when it comes to outsourcing (nearshoring); 	<ul style="list-style-type: none"> - Low level of specialisation among ICT companies; - Lack of cooperation among companies as well as other stakeholders; - Lack of references and experience in getting (big) contracts; - Insufficient knowledge and skills on international market penetration – low level of internationalisation; - Absence of FDI presence in Serbia in large numbers; - Insufficient inflow of new programmers and other ICT graduates; - Lack of problem solving skills and entrepreneurial spirit, excessive theoretical knowledge and inadequate general and specific technical skills;
Opportunities	Threats
<ul style="list-style-type: none"> - Low penetration of IT/ICT within Serbian business sector makes a good market potential in future; - Geographical proximity to the European market opens outsourcing potentials; - The government, line ministries and international development organisations recognise ICT as one of the key sectors; - EU integration of Serbia will have a positive impact on the ICT sector; - Using experts from Diaspora for entering foreign markets; - Nearshoring - targeting the regional market and Central and Eastern Europe; - The Serbian Government's plans for the development of the IT market and setting up a range of technology parks in Belgrade, Niš, Novi Sad and Inđija, the last to be the largest technology park in the region; - As the automotive industry is experiencing a second wave and new large investments and agriculture being one of the most promising sectors, deepening cooperation between them and IT could be a booster for all the parties included. 	<ul style="list-style-type: none"> - Brain drain of ICT professionals; - Financial crisis and other instabilities at targeted international and domestic markets; - Insufficient demand from the local economy; - Unfavourable policies and regulations as well as non-transparent public procurement system; - Great inflow of foreign IT companies might seriously hamper the existing IT labour market; - Social charges as one of the most burdensome types of tax. Since the IT sector is very labour intensive by definition, it is understandable that this is seen as a problem.

CONCLUSIONS

The ICT Sector has been widely recognised by policy makers and development organisations as one of the key export-oriented service industries in Serbia. Regulation of the ICT sector has been put at a high level by establishing the Ministry for Telecommunications and Information Society. In addition, numerous regulatory agencies have been established to further advance and monitor policies in regard to the ICT sector. Legislation has also been improved and key strategic documents adopted. Activities regarding e-Government and electronic signature have also been initiated. All of these create an impression of positive development in the regulatory sphere of the ICT sector.

However, the climate in Serbia is far from being favourable for doing business. Transition in Serbia started much later than in the other SEE countries. Privatisation of socially and state-owned enterprises did not succeed in attracting a large amount of FDIs or in developing domestic industry and services. In 2010, industrial production in Serbia has only 42.2% of the industrial production in 1989, which makes it the lowest production in Europe⁴⁸. Comparing to world leading indicators in economic development, Serbia is standing behind almost all other European countries.

Due to the impact of the global economic crisis, in the last three years the situation in Serbia became dramatic. Depression of the Serbian economy has been reflected in the ICT sector as well. Policy interventions to undermine the effects of the crisis so far have not produced positive results.

The ICT sector in Serbia can be divided between a relatively strong telecommunication sub-sector and a rather weak IT sub-sector. In 2008, the telecommunication sub-sector in Serbia was worth about €1.65 billion, with a GDP share of 4.5–5% and an annual growth rate of 10%. Telecommunications employs about 50,000 people in about 2,500 companies. The telecommunication sub-sector is expected to grow faster after incoming privatisation of the Serbian state-owned telecom company and the introduction of a second landline phone operator.

The IT sub-sector is estimated to have a market value of €445 million in 2010, which is about €100 million less than in 2008. Export of IT services has been estimated at €130 million in 2009. After multi-annual positive growth until 2007, IT started to decline by 18.74% in 2008 and a dramatic 22.20% in 2009. The estimated number of IT companies is between 1,520 and 1,600, excluding artisans and entrepreneurs (2,021), and about 10-12,000 professionals.

The IT sub-sector in Serbia is segregated into micro- and small enterprises with less than 15 employees and a low degree of specialisation and innovation. Due to these weaknesses, companies have limited access to international markets. However, a number of companies are active in the outsourcing market, producing software modules or embedded hardware parts for companies from the U.S., the Netherlands, Germany and other countries.

In Serbia, the majority of IT companies are active in the retail of hardware, since demand for delivery of computers and other hardware equipment is still at a high level. Demand for other services is significantly less.

ICT companies are mostly concentrated in Belgrade, Novi Sad and Nis to some extent. This factor creates a good potential for clustering within the sector. There are two main clusters active in ICT sector: (1) ICT Network Cluster, recently established as a merger of Serbian Software Cluster and Embedded.rs and (2) Vojvodina ICT Cluster.

ICT education in Serbia annually produces about 2,000+ ICT graduates, half of them at universities and faculties in Belgrade. This number is not sufficient to satisfy the needs of the domestic market, however, since in 2009 alone the IT sub-sector employed about 2,300 professionals. There is an evident need for more investment in IT education since the current system is not adequate. For instance, per capita investment in IT education in Serbia is six times less than in Croatia and Slovenia, and 30 - 90 times less than in EU countries. This analysis confirms previous fears that a higher inflow of FDIs in the IT sector might seriously distort the domestic labour market.

⁴⁸ B92 Article 'Proizvodnja tek 40% od nivoa 1989' (in Serbian) from October 4, 2010. Please visit: http://www.b92.net/biz/vesti/srbija.php?yyyy=2010&mm=10&dd=04&nav_id=462805

All studies show a relatively good quality of Serbian ICT/IT professionals, especially comparing the market price of human capital. Geographic proximity of Serbia to the Western European market is also an advantage for the ICT sector.

Public universities and research centres primarily do research in Serbia. Involvement of the private sector in this regard is limited. Research institutes become involved in transnational FP6 and FP7 projects, which increased their capacity in this regard. Many of these projects are in the ICT field.

ICT companies are involved in the development of new and innovative products that might increase their competitiveness on domestic and international markets. Development is usually done within the company, sometimes with the engagement of external experts or companies with expertise specific in the product that is going to be developed. There is a limited cooperation between ICT companies in developing joint products.

Networking between the public and private sector is still at the early stages of development. ICT companies rarely cooperate since they usually fight for the same market. However, this trend has been changing in recent years. ICT companies have started to create consortia for tenders since none of the companies individually have enough competencies, skills and references to beat well-known international competitors.

Cooperation with public sector has been instrumentalized through an ICT Forum, organised by the Ministry of Telecommunications and Information Society. However, the Forum has to be further capacitated by a set of soft skills that will ensure the successful facilitation and coordination of all actors involved. Other channels of communication and dialogue between public and private entities have been institutionalised through cluster initiatives that gather companies, universities and research centres. International development organisations with their project interventions have also contributed to the dialogue and development of trust between different stakeholders in the ICT sector.

METHODOLOGY

The herewith-presented study is part of the assignment: “Quantitative and Qualitative Analysis and Research of the Serbian ICT Industry and Market”, funded by GTZ/WBF and implemented by InTER. The assignment has five complementary objectives:

1. Connection and complementation of the pre-existing ICT Directory 2009 and its implementation as an online database;
2. Research and understanding of baseline documents available on the ICT industry and market;
3. ICT Stakeholder Analysis;
4. ICT Sector Study 2010;
5. SWOT analysis
6. Recommendations.

Each of the objectives of the assignment has been broken down into concrete tasks and expected deliverables.

The main purpose of the assignment is to provide an overview and understanding of the current situation in the ICT Sector in Serbia, assessing the trends, market potentials and role of different players from the public and private sectors. The study provides practical and useful recommendations for GTZ/WBF and GIZ/ACCESS, policy makers and other parties interested in the development of the ICT Sector in Serbia.

The applied methodology presents a combined desk analysis of secondary source data and interviews held with the key players from public and private sector agencies. Secondary source information was collected from various locations, using academic and political research literature, as well as publications and studies developed by public sector institutions (including the Ministry of Telecommunication, SIEPA, the Statistical Office, RATEL and the Chamber of Commerce,) as well as by international and bilateral development organizations such as GIZ, OECD, UNDP, USAID and others.

Primary data for the study has been collected through individual and collective interviews with key players from both the public and private sectors. Universities and research institutions were also included.

Interviews with stakeholders were guided by the questionnaire, which met all the requirements of the ToR. During the period May – July 2010, 16 interviews were held with 21 representatives from 17 institutions, organizations and companies (see Annex 2 for the full list of interviews). A small number of stakeholders were not available for interview but contributed to the study by sending their answers on the completed questionnaire.

ANNEX 1: STAKEHOLDER ANALYSIS

The Stakeholder Analysis presents a separate overview of key players in the sector, including a brief assessment of their capacity for developing ICT in Serbia. The analysis focuses on institutions and agencies, whether public or private, that are influential in driving changes and engineering the development of the Sector. The analysis also takes into consideration influential individuals that play an important role in Serbia's ICT industry.

The stakeholders have been divided into five groups:

- A. Public Sector,
- B. Chambers and Associations,
- C. Universities, Institutes and Research Centres,
- D. Main Companies in the ICT field, and
- E. International donor agencies.

A. PUBLIC SECTOR

Ministry of Telecommunications and Information Societies⁴⁹: The Ministry of Telecommunications and Information Societies (MTIS) has been established by the Law on Ministries (see Article 18 of the Law on Ministries from July 5, 2008) to regulate government duties in the spheres of telecommunications and information technology. The Ministry is headed by Mrs. Jasna Matic, a Minister with a strong professional background in export promotion, which makes her very influential among public and private agents in the ICT sector.

MTIS has proclaimed six goals to be achieved during the term of office, which are as follows:

- Faster harmonisation with EU regulations and more effective application of the Law on Telecommunications;
- Introduction of new electronic services for industry and for citizens;
- Completion of the legal framework and implementation of laws in the field of ICT and postal services;
- Implementation of e-government projects, along with the "one-window" principle;
- Application of ICT in education, and the enhancement of education for information society's needs;
- Development of the national information and communication technologies market, and bolstering the position of local industry within this sphere.

Being the central ministry in the ICT field, MTIS has initiated numerous projects in which they cooperate with other Ministries or public sector agencies, but also with international development organisations and the private sector. Without going into detail, it is worth mentioning projects on e-Governance⁵⁰ (in cooperation with the National Information Technology and Internet Agency) and Digital School⁵¹ (in cooperation with primary schools).

MTIS is also active in organising dialogue with the private sector through an ICT Forum, which is held at least once a year and gathers the key stakeholders in the field.

National Information Technology and Internet Agency⁵²: The National Information Technology and Internet Agency (NITIA) is a professional public sector agency established with the goal of contributing to public administration reform in accordance with the principles of modernisation and the application of state-of-the-art achievements in the fields of system engineering, information and communication

⁴⁹ For more information on MTIS please visit the website: www.mtid.gov.rs, last accessed on August 15, 2010

⁵⁰ For more information on e-Governance Project please visit the website: www.euprava.gov.rs, last accessed on August 15, 2010

⁵¹ For more information on Digital School Project please visit the website: www.digitalnaskola.rs, last accessed on August 15, 2010

⁵² For more information on NITIA please visit the website: www.www.rzii.gov.rs, last accessed on August 15, 2010

technologies. The agency has administrative responsibilities in the fields of applying information and communication technologies to public authorities, self-government bodies and public services, regulated by laws and other regulations. Therefore, NITIA is in charge of the development and introduction of an e-Government platform, in which they closely cooperate with line ministries, self-government authorities and other public sector entities.

According to NITIA's website, they target the following results: (1) promotion of the services provided to citizens and business entities; (2) creation of a more reliable and competitive environment for business and foreign investment; (3) development of the local ICT sector; (4) encouragement of economic growth; (5) stimulation of employment; (6) advancement of the development and the technological basis of the country; (7) reaching the level of development of the ICT advanced countries; and (8) expansion of the process of regional cooperation and European integration.

NITIA is active in producing analysis, guides and other kinds of publications on e-Governance issues, targeting central and local level administrations⁵³. They have published two analyses of progress in the implementation of e-Governance in Serbia (for 2008 and 2009), as well as the Handbook for ICT in Local Self-government Units, guidelines and best practices in establishing web-based presentations of public administration at both central and local levels, and an analysis of the ICT infrastructure in Serbian cities and municipalities.

Republic Agency for Electronic Communication⁵⁴: The Republic Agency for Electronic Communication (RATEL) was established under the Telecommunication Law as an autonomous and independent public organisation, exercising its authority for the purpose of establishing conditions for efficient implementation and promotion of the telecommunications policy in the Republic of Serbia. RATEL regulates and monitors activities in the telecommunications sector, including providing concessions and licences to mobile operators and TV/Radio broadcasters.

Although established relatively recently (in 2005), RATEL promptly became one of the most influential and powerful agencies in the field of telecommunications.

Since 2007, RATEL has been publishing a periodic magazine called "Telekomunikacije", that cover topics on ICT and telecommunications. The magazine can be accessed on the website: www.telekomunikacije.rs.

Ministry of Science and Technology Development: The Ministry of Science and Technology Development (MSTD) was established by the Law on Ministries (see Article 14 of the Law on Ministries from July 5, 2008) to regulate government duties in the spheres of science, research, technology development and innovation.

MSTD has prepared the Strategy for Scientific and Technology Development of the Republic of Serbia for the period 2010 – 2015⁵⁵. The strategy provides an important role in the development of ICT, recommending it as one of the seven key national priorities for the development of science and technology⁵⁶.

MSTD closely cooperates with the Ministry of Telecommunications and Information Societies, the Ministry of Economy and Regional Development and the Ministry of Education, as well as public agencies working on issues related to ICT development in Serbia.

Since MSTD regulates the work of scientific and research centres in Serbia, they keep a register of the country's scientific and higher education institutions. This register is publicly available on the MSTD

⁵³ NITIA publications in Serbian are available at the web-address: <http://www.rzii.gov.rs/?current=6>, last accessed on August 15, 2010

⁵⁴ Sometimes for RATEL is used translation "the Republic Telecommunication Agency", see the translation of the Statute at the official RATEL website http://www.ratel.rs/about_ratel/statute.112.html, last accessed on August 15, 2010.

⁵⁵ The strategy is available for download at the MSTD website:

http://www.nauka.gov.rs/eng/images/stories/vesti/Strategy/serbian_rd_strategy.pdf, last accessed on August 15, 2010.

⁵⁶ The Strategy, page 25 of the Serbian edition;

website⁵⁷. Furthermore, the website has a database of organisations and individuals working in the field of research and technological development⁵⁸.

MSTD has implemented a programme of funding for scientific research over the period 2006-2010. Among other fields, the programme has been supporting projects in mathematics and mechanics, many of which were related to the ICT sector⁵⁹.

In addition, since 2005 the MSTD has organised a national competition for the best technological innovation⁶⁰. The competition is organised in two rounds and has an educational element, as competitors who pass the first round get the opportunity to be trained in business and marketing plan development. The final selection of the best innovation is done at the end of each year. In most cases, the awarded business innovations are in the field of innovative IT and embedded solutions for energy efficiency.

MSTD is also in charge of coordinating the Seventh Framework Programme of the European Union for Research, Technological Development and Experienced Activities (so called FP7⁶¹). MSTD was previously in charge of the Sixth Framework Programme (FP6⁶²), and has participated in several project initiatives funded by the FP6 and FP7 programmes, such as ERA Western Balkans⁶³, SEE-ERA.NET⁶⁴, IDEAL-IST.NET⁶⁵, WBC-INCO.NET⁶⁶ and a number of others. Each of these programmes focuses on strengthening networking, technology transfers and innovation between policy makers, scientific institutes, research and development centres and universities from the EU and Western Balkan countries. ICT was a significant topic in all those projects. The role of the MSTD has been to coordinate activities within Serbia and to provide data and advice.

Finally, MSTD is also participating in the ICT Policy Support Programme, funded under the EU Competitiveness and Innovation Programme (CIP), with the aim of “stimulating innovation and competitiveness through the wider uptake and best use by citizens, governments and businesses, particularly Small and Medium-sized Enterprises”⁶⁷. The Republic of Serbia signed the Memorandum of Understanding for participation in the ICT-PSP on 23rd October 2009, which means that organisations from Serbia have been eligible to apply for funding as of 2010.

Ministry of Economy and Regional Development⁶⁸: The Ministry of Economy and Regional Development (MERD) has no direct responsibility in the field of ICT. However, since MERD is in charge of making a favourable economic climate for business growth, their policies and activities directly or indirectly affect ICT companies as well. Moreover, MERD actively participates in ICT forums and other events, which gathers the ICT industry in Serbia.

In cooperation with other public agencies (the Agency for Development, the National Employment Service and the National Agency for Regional Development) MERD is running several programmes in the fields of attracting foreign direct investments, reducing the burden of unemployment, providing business start-up support, competitiveness, etc. None of these programmes specifically target ICT companies, but they are welcome to apply for support under these grants.

⁵⁷ For downloading the list of registered scientific and research institutes (in Serbian) please visit the page: http://www.nauka.gov.rs/cir/index.php?option=com_content&task=section&id=12&Itemid=40, last accessed on August 15, 2010.

⁵⁸ Website: partners.nauka.gov.rs, last accessed on August 15, 2010.

⁵⁹ For the list of awarded projects in all fields, please visit: <http://www.nauka.gov.rs/rezultati/>, last accessed on August 15, 2010.

⁶⁰ For more information on the competition please visit the official webpage: <http://inovacija.org/>, last accessed on August 15, 2010.

⁶¹ More information on FP7 might be seen on official webpage of the Programme: http://cordis.europa.eu/fp7/home_en.html, last accessed on August 15, 2010.

⁶² More information on FP6 might be seen on official webpage of the Programme: <http://cordis.europa.eu/fp6/dc/index.cfm?fuseaction=UserSite.FP6HomePage>, last accessed on August 15, 2010.

⁶³ More information on the Programme website: www.westbalkanresearch.net, last accessed on August 15, 2010.

⁶⁴ More information on the Programme website: www.see-era.net, last accessed on August 15, 2010.

⁶⁵ More information on the Programme website: www.ideal-ist.net. The page was unavailable to access on August 15, 2010.

⁶⁶ More information on the Programme website: www.wbc-inco.net, last accessed on August 15, 2010.

⁶⁷ For more information on ICT-PSP Programme, please visit: http://ec.europa.eu/information_society/activities/ict_psp/about/index_en.htm, last accessed August 15, 2010.

⁶⁸ More information on MERD to be read at the website: www.merr.gov.rs, last visited on August 15, 2010.

Among other projects, it is worth of mentioning the Cluster Development Project 2006-2011, which supports the Serbian Software Cluster and the Embedded.rs Cluster. Those two clusters have recently merged to ICT Net Cluster.

MERD is in charge of coordinating the EU Competitiveness and Innovation Programme (CIP), which supports innovation activities (including eco-innovation), providing better access to finance and delivering business support services. In addition, CIP encourages a better take-up and use of ICT and helps in developing information society. CIP is running from 2007 to 2013 with a budget of 3,621 million Euros, which is divided into three main areas: (1) Entrepreneurship and Innovation Programme (EIP), (2) Information Communication Technologies Policy Support Programme (ICT-PSP), and (3) Intelligent Energy Europe Programme (IEE). The Republic of Serbia is included in first two CIP components (EIP and ICT-PSP) but not in the third one (IEE)⁶⁹ at present.

National Agency for Regional Development⁷⁰: The National Agency for Regional Development (NARD) was recently established (in 2009) by the transformation of the Serbian Agency for development of small and medium-sized enterprises and entrepreneurship. Like MERD, NARD does not have direct responsibilities in the field of ICT development, yet their programmes and activities are open to ICT companies to apply for.

Among other initiatives, NARD traditionally organises an SME and entrepreneurship fair called “Business Baza” that gathers many innovative enterprises and business support agencies in the field of ICT.

NARD is in charge of coordinating the EU Project: Enterprise Europe Network (EEN), which aims to help small and medium-sized enterprises take advantage of business opportunities in the European Union. The project is funded under the CIP programme and implemented by NARD, SIEPA, Institute Mihajlo Pupin and state universities in Belgrade, Nis and Novi Sad⁷¹.

Serbia Investment and Export Promotion Agency⁷²: The Serbian Investment and Export Promotion Agency (SIEPA) is the governmental agency established in 2001 with the mission of assisting foreign investors and buyers to successfully establish their businesses in Serbia, as well as supporting the export of Serbian industries and services abroad.

SIEPA recognises ICT and electronics as key industries in Serbia and actively promotes investment and export opportunities in these fields. In that regard, SIEPA is very active in helping Serbian companies with promotion at the most important ICT fairs, such as CeBIT and Embedded World. SIEPA is also active in organising B2B and B2C events, as well as in providing financial support for the certification process of companies in Serbia.

Vojvodina Investment Promotion Fund⁷³: The Vojvodina Investment Promotion Fund (VIP) is an agency established and funded by the Parliament of the Autonomous Province of Vojvodina, with the mission of enabling economic development through the facilitation of foreign direct investments and the provision of professional services to foreign companies that wish to invest in Vojvodina, thereby strengthening local economic competitiveness through the creation of new jobs and increasing household revenues in the province.

VIP is an active player in business development in Vojvodina, which actively supports the ICT sector in the province. In that regard it is necessary to mention VIP’s activities in establishing a regional ICT Cluster in Vojvodina, where they acted to promote the idea of clustering and as a “mobiliser” of key stakeholders.

⁶⁹ More about CIP project in Serbia to be read at the website: www.cip-srbija.rs, last accessed on August 15, 2010.

⁷⁰ More information on NARD can be read at their official website: www.narr.gov.rs, last accessed on August 15, 2010.

⁷¹ More about the EEN project in Serbia might be found on the website: www.een-srbija.rs, last accessed on August 15, 2010.

⁷² More about SIEPA on the official website: www.siepa.gov.rs, last accessed on August 15, 2010.

⁷³ More about VIP on the official website: www.vip.org.rs, last accessed on August 15, 2010.

Statistical Office of the Republic of Serbia⁷⁴: The Statistical Office of the Republic of Serbia is the main producer and disseminator of official statistics, as well as the authorised professional agent, organiser and coordinator of the system of official statistics of the Republic of Serbia, providing official Serbian statistics to the international statistical system.

The Statistical Office does not have a direct role in the development of the ICT sector in Serbia. However, as a main provider of official statistical data, they play an important role in the quantitative analysis of ICT sectors. In addition, the Statistical Office contributes to the ICT sector by providing their own analyses in the field, such as the annual publication on the usage of information communication technologies by households and companies in the Republic of Serbia⁷⁵.

B. CHAMBERS AND ASSOCIATIONS

Serbian Chamber of Commerce⁷⁶: The Serbian Chamber of Commerce (SCoC) is in the service of the economy of Serbia and trustee and promoter of its interests. The chamber system in Serbia encompasses the provincial Chambers of Commerce in Vojvodina, Kosovo and Metohia, the Belgrade Chamber of Commerce and 16 regional Chambers of Commerce, with their head offices in Valjevo, Zaječar, Zrenjanjin, Kikinda, Kragujevac, Kraljevo, Kruševac, Leskovac, Niš, Novi Sad, Pančevo, Požarevac, Sombor, Sremska Mitrovica, Subotica and Užice. The long-term aims of the Serbian Chamber of Commerce are to create a stable and competitive economy, improve the business and investment environment, create higher living standards for its citizens and promote the development of Serbia.

SCoC is quite active in the field of ICT development since they recognise this sector as one of the most competitive branches of the Serbian economy. SCoC organises conferences, workshops, fairs and B2B events and in that regard they closely cooperate with the government structures and all other important stakeholders in the ICT field. SCoC also frequently represents the interests of ICT companies to government institutions, in addition to which it is active in producing analyses and reports of the ICT sector in Serbia.

Serbian ICT NET Cluster: The Serbian ICT cluster has recently been established through the merger of two other clusters: the Serbian Software Cluster and the Embedded.rs Cluster.

Serbian Software Cluster⁷⁷ (SSC) was established in 2006 as a business association of 16 members, including thirteen of the most competitive private companies, and three renowned university faculties in Belgrade and Novi Sad. SSC is recognised as the representative of Serbian software organisations, having a very strong relationship with MERD, MTIS and SIEPA. SSC also cooperates very closely with the SCoC and universities, as well as with international development organisations such as GIZ, USAID and others.

SSC has been active in helping the Serbian software industry to create marketing campaigns and make joint representations at international trade fairs such as CeBIT. SSC additionally assists companies to obtain certificates, government support and market intelligence as well as network with universities and other research institutions.

Embedded.rs⁷⁸ is an association organised on similar principles, but focuses on embedded industry in Serbia. Embedded.rs is equally well-recognised and supported by national ministries and international organisations, and is supported in a similar manner to SSC.

Consequently, the administrators and members of the two clusters took the decision to merge the two clusters and make an umbrella association to more efficiently accommodate the needs of both, IT and

⁷⁴ More about the Statistical Office on the official website: www.stat.gov.rs, last accessed on August 15, 2010.

⁷⁵ Available in English and Serbian on the website of the Statistical Office.

⁷⁶ More on Serbian Chamber of Commerce on website: www.pks.rs, last accessed on August 15, 2010.

⁷⁷ More on Serbian Software cluster on website: www.ssc.rs, last accessed on August 15, 2010.

⁷⁸ More on Embedded.rs cluster on website: embedded.rs, last accessed on August 15, 2010.

embedded based companies. The process of merging these two clusters should be completed by the end of 2010.

Vojvodina ICT Cluster⁷⁹: Vojvodina ICT cluster is a bottom-up initiative of twenty-three ICT companies from Vojvodina, the Faculty of Technical Sciences in Novi Sad, the development agency Alma Mons – Novi Sad and the Centre for Competitiveness and Cluster Development. GTZ/WBF has also supported the Cluster as well.

The Cluster has been formally registered in May 2010 and officially presented in public in October 2010. The Cluster has strategic goals focused to better networking, joint advocacy and marketing, applying for EU/international grants and joint tendering.

Vojvodina ICT Cluster members employ about 1,500 people and they reached annual turnover of 26 million Euros in 2009. In spite of the crisis, the cluster members realised annual growth of 23.4% (in 2008) and 30.61% (in 2009).

Although still in the phase of being established, Vojvodina ICT cluster will be one of the key players in the ICT field in Serbia, especially bearing in mind the number of ICT companies in Novi Sad and the importance of the Faculty of Technical Sciences in Novi Sad.

JISA – Union of ICT Societies of Serbia⁸⁰: JISA was originally established in 1994 as the Yugoslav ICT Association (in Serbian: Jugoslovenski Informatički **SA**vez), changing its name in 2006 to the one that is used today: JISA – Union of ICT Societies of Serbia. JISA was established as a not-for-profit association with three main goals: (1) to improve knowledge on new technology, in which regard JISA established the magazine **JISA InfoReview**, which is published in English and Serbian⁸¹; (2) to promote education in the ICT sector by organising seminars and specialised professional forums; and (3) to create mechanisms for sharing experience in new technology and provide solid commercial and technical support to suppliers of ICT equipment.

JISA is active in international networking, project management and research participation. They are also well known for organising useful conferences and other events in the field of ICT.

In cooperation with the Assembly of the European ICT Association, the European Chamber of Commerce, as well as the Chambers of Commerce and ICT associations from the Western Balkans, JISA is in charge of coordinating the annual information association DISKOBOLOS award, which is given to companies for the modern use of ICT in everyday business.

JISA has a good relationship with line ministries, other public sector agencies and principal companies in the field of ICT.

Information Society of Serbia⁸²: The Information Society of Serbia (ISS) is a non-governmental organisation for information systems and computer networks that gathers both experts and businessmen in the field of ICT.

ISS is active in the organisation of symposiums, conferences and various forms of training and educational activities. Traditionally each year they organise a conference on e-Governance (called IS DOS or, in Serbian, *Informacioni sistem državnih organa Republike Srbije*). This year, the e-Governance conference is going to be organised on 11-12 October 2010 in Sava Centar, Belgrade.

ISS also regularly organises the YU Info conference, which gathers ICT experts and companies from Serbia and other Western Balkan countries. This year YU Info was organized in Kopaonik and involved more than 350 ICT experts and managers⁸³.

⁷⁹ Internet presentation of Vojvodina ICT Cluster: vojvodinaictcluster.org, last accessed on August 15, 2010.

⁸⁰ Internet presentation of JISA might be seen on www.jisa.rs, last accessed on August 15, 2010.

⁸¹ Internet presentation of the magazine JISA InfoReview is available on the www.inforeview.biz, last accessed on August 15, 2010.

⁸² For more information on Information Society of Serbia please visit www.e-drustvo.org, last accessed on August 15, 2010.

ISS clearly has a good networking and mobilising capacity among private and public sector entities. Additionally, ISS actively participates in regional and trans-national projects funded under FP6 and FP7 such as SEE Innovation, TRISTAN and SCORE.

ASIT - Association for Computing, Informatics, Telecommunications and New Media of Serbia: ASIT is also a prominent non-governmental organisation, active in organising high-profile conferences, seminars and trainings in the field of ICT.

Some of the most important events organised by ASIT are:

- Smart e-Government⁸⁴, the sixth international conference and exhibition of state-of-the-art e-Government Services and Trusted Electronic Identity, organized in cooperation with the Serbian Ministry of Interior, the Serbian Ministry of Telecommunications and Information Societies and the Serbian Chamber of Commerce. The 2010 conference will be held from October 28th-29th in the Hotel Continental in Belgrade.
- Technobank⁸⁵, an annual conference on innovation in the banking sector. This year the conference was held in Belgrade, on April 14th & 15th, with participants from South-Eastern Europe, on the topic: Innovation in Banking and Retail Technologies. Among other topics, the conference discussed the application of innovative ICT technologies in the banking sector. It was organised in cooperation with the Ministry of Finance, the National Bank of Serbia and the Serbian Chamber of Commerce

ASIT publishes an electronic magazine, *Personal Magazin*⁸⁶, which disseminates information and news in the IT sector in Serbia and worldwide. ASIT also participates in IT-related projects financed under international and EU grants.

Drustvo za Informatiku Srbije⁸⁷: (In English: Informatics Association of Serbia) – DIS is a professional association for citizens, established in 1973. The association is active in organising conferences, round tables, lectures and other events in the field of ICT. In organizing its events, DIS closely cooperates with the Serbian Chamber of Commerce.

JURIT⁸⁸: The Association of Accounting, Informatics, Telecommunications, Automation and Management in Serbia (official acronym JURIT) is a not-for-profit organisation, which organises INFOTECH, one of the most significant ICT events in Serbia. INFOTECH is organised under the auspices of the Serbian Ministry for Telecommunications and Information Societies, the National Bank of Serbia, the Serbian Chamber of Commerce and IEEE Serbia and Montenegro, and in cooperation with domestic and foreign companies and ICT users. INFOTECH is typically held in Vrnjacka Banja⁸⁹.

IEEE Serbia and Montenegro⁹⁰: IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE was established in Yugoslavia in 1971. IEEE Serbia & Montenegro Section is the successor of the former IEEE Yugoslav branch. IEEE Serbia and Montenegro Section is active in (co-)organising conferences, forums and thematic events in the field of ICT.

⁸³ For the report on YU Info 2010 conference please visit the webpage: <http://www.e-drustvo.org/yuinfo/yuinfo2010.html>, last accessed on August 15, 2010.

⁸⁴ The official website of the conference is www.smartegov.rs, last accessed on August 15, 2010.

⁸⁵ The official website of the conference is www.technobank.rs, last accessed on August 15, 2010.

⁸⁶ Web-based "Personal Magazine" might be read at www.personalmag.rs, last accessed on August 15, 2010.

⁸⁷ For more information on DIS, please visit: www.dis.org.rs, last accessed on August 15, 2010.

⁸⁸ Form more information on JURIT please visit the website: www.jurit.rs, last accessed on August 16, 2010.

⁸⁹ More information about INFOTECH is available on the website: www.infotech.org.rs, last accessed on August 16, 2010.

⁹⁰ More information on IEEE Serbia and Montenegro section is available on the website: www.ieee.uns.ac.rs, last accessed on August 16, 2010.

Društvo itSMF Srbije⁹¹: Društvo IT Service Management Forum Srbije (itSMF Serbia) is a membership-based not-for-profit organisation, established under the framework of the international IT Service Management Forum network⁹², with the mission to develop and promote IT service management best practices in Serbia and to support its members in broadening their knowledge in the field of service management and the ICT sector in general. itSMF is active in organising forum discussions and best practice dissemination in various fields of ICT.

ETRAN⁹³: ETRAN is not-for-profit organisation, active in the field of electronics, telecommunications, computer sciences, automation and nuclear engineering. ETRAN organises an annual conference called “ETRAN”, which gathers experts, policy makers and scholars active in the field of ICT.

Društvo za telekomunikacije⁹⁴: (DT, or in English, the Association for Telecommunications) is a not-for-profit organization established in 1993 with the mission of promoting advancements in development of the telecommunication sector. DT is active in organising conferences in the field of telecommunications, such as the Telecommunication Forum (TELFOR), traditionally organised in cooperation with the School of Electrical Engineering of the University of Belgrade and IEEE Serbia and Montenegro⁹⁵.

Serbian National Register of Internet Domain Names (RNIDS)⁹⁶: RNIDS is an expert non-governmental and non-profit organisation which is not affiliated with any political party and which manages the national registry of Internet domain names in the Republic of Serbia.

eRazvoj (e-Development)⁹⁷: eRazvoj is a “new player in town”. It is a voluntary, non-governmental and non-profit association, founded with the aim of accomplishing targeted goals and objectives in the field of information society development. Although only established in March 2010, over a short period of time eRazvoj has succeeded in mobilising numerous scholars, civil servants and practitioners in the ICT field. Considering the clear mobilisation capacity, eRazvoj may be a significant player in the ICT field in the future.

C. UNIVERSITIES, INSTITUTES AND RESEARCH CENTRES

C.1. University of Belgrade

School⁹⁸ **of Electrical Engineering**⁹⁹: The School of Electrical Engineering (official acronym: ETF) is probably the most respected higher education institution in the field of ICT, focusing mostly on electronics, telecommunications and automation but also working in the field of software development. ETF organises education at undergraduate and postgraduate levels. Besides this, ETF is active in research and in that regard they participate in many international projects (including participation at FP6 and FP7 projects) in the ICT field.

ETF has three Centres: Computing Centre, Educational Centre and Innovations Centre, and is a co-founder of the Business-Technology Incubator of Technical Faculties in Belgrade. In addition, ETF has

⁹¹ More information on itSMF International is available on the website www.itsmf.org.rs, last visited on August 16, 2010.

⁹² More information on itSMF Serbia is available on the website www.itsmfi.org, last visited on August 16, 2010.

⁹³ More information on ETRAN is available on the website: etran.etf.bg.ac.rs, last visited on August 16, 2010.

⁹⁴ For more information on the DT please visit the website: www.dt.rs, last visited on August 16, 2010.

⁹⁵ More information on TELFOR conference might be seen at the official website of the conference: www.telfor.rs, last visited on August 16, 2010.

⁹⁶ More information about RNIDS is available on the website: www.rndis.rs, last accessed on September 25, 2010.

⁹⁷ More information on eRazvoj is available on the website: www.erazvoj.com, last accessed on August 16, 2010.

⁹⁸ Due to inconsistency in English language translation, terms “the School” and “the Faculty” are used for describing high-education institution on the same level. The Study is using terms, which are used on official websites of the respective institutions.

⁹⁹ More information on the School of Electrical Engineering is available on the website: www.etf.rs, last accessed on August 16, 2010.

improved their cooperation with the private sector, mostly through their membership in the two leading clusters in the ICT field, Serbian Software Cluster and Embedded.rs.

School of Mathematics¹⁰⁰: The School of Mathematics has a special study program on informatics, focusing mostly in the fields of computer programming and software development in which they have competitive advantage over other similar schools in Serbia. The study programme is organised at undergraduate and postgraduate levels.

The School actively participates in a number of projects, some of which are funded under international schemes, for example the project COST ICT Action IC0901: Rich-Model Toolkit - An Infrastructure for Reliable Computer Systems¹⁰¹.

The School is not active in communications with the private sector.

Faculty of Organisational Sciences¹⁰²: the Faculty of Organisational Sciences (official acronym: FON) mainly focuses on management and organisational sciences, though they have a study programme that focuses on information systems and technologies. FON is also active in research and development, having research centres and laboratories active in various fields¹⁰³. FON is active in communication with other universities and research centres but also with private sector parties.

C.2. University of Novi Sad

Faculty of Technical Sciences¹⁰⁴: The Faculty of Technical Sciences was founded in 1960 as a part of the University of Belgrade. Later on that year the University of Novi Sad was established and the Faculty, together with six other faculties which existed on the territory of Vojvodina, became one of its constituent parts.

The Faculty is organised across thirteen departments and nine centres, established in the various fields of technical sciences, including ICT¹⁰⁵.

The Faculty plays an important role in the development of the ICT industry in Serbia, especially in Vojvodina. The Faculty has served as a catalyst for establishing numerous companies in the field of ICT. It is active in research and development, creating a lot of innovation spillovers to local ICT companies. Besides which, the Faculty is proactive in the creation of many projects in the field of ICT development, including the recent formation of the Vojvodina ICT Cluster.

Faculty of Sciences - Department of Mathematics and Informatics¹⁰⁶: The Department of Mathematics and Informatics focuses on study programmes in the fields of mathematics, software development and computer programming. The Department is organised within nine study programmes at undergraduate and postgraduate levels. The Department is also active in the field of research in cooperation with other universities in Europe across various projects.

¹⁰⁰ More information on the School of Mathematics is available on the website: www.matf.bg.ac.rs, last visited on August 16, 2010.

¹⁰¹ More about this project might be read at the webpage: http://www.cost.esf.org/domains_actions/ict/Actions/IC0901-Rich-Model-Toolkit-An-Infrastructure-for-Reliable-Computer-Systems-End-date-October-2013, last accessed on August 16, 2010.

¹⁰² More information on the School of Mathematics is available on the website: www.matf.bg.ac.rs, last visited on August 16, 2010.

¹⁰³ FON has developed a special website (in Serbian), focusing on scientific research and innovation development. The website link is: <http://nid.fon.rs/>, last visit: August 16, 2010.

¹⁰⁴ More information on the Faculty of Technical Sciences is available on the website: <http://www.ftn.uns.ac.rs/english/>, last accessed on August 16, 2010.

¹⁰⁵ Complete list of Departments and Centers is available on the Faculty website.

¹⁰⁶ More information on the Department is available on the website: www.dmi.uns.ac.rs, last visited on August 16, 2010.

C.3. University of Nis

Faculty of Electronic Engineering¹⁰⁷: The Faculty of Electronic Engineering has a history of more than 45 years of education at undergraduate and postgraduate levels. The faculty has more than 2,000 students within ten departments in the fields of automation, computer sciences and informatics, electronics, microelectronics, telecommunications, etc. Research is organised through 7 thematic laboratories¹⁰⁸ and numerous projects funded under national, international and commercial schemes.

Faculty of Sciences - Department of Mathematics and Informatics¹⁰⁹: The Department of Mathematics and Informatics focuses on study programmes in the fields of mathematics and computer programming. The Department is involved in research and projects, funded by international and national donors. There is an Institute for Mathematics operating within the framework of the Department.

C.4. Other Universities

Faculty of Information Technologies of the Metropolitan University¹¹⁰: The Faculty of Information Technology (FIT) is a private school of the Metropolitan University, based in Belgrade. FIT organizes higher education programmes at undergraduate level in the field of information technology and management of information systems, and at postgraduate level in the field of information systems and software engineering (including a special programme on software development for computer games and animations). Within the framework of FIT there is a centre for professional development of human capital in the field of ICT, called Pro Academia¹¹¹

Racunarski Fakultet: (RAF, or in English: School of Computing) was established by the private company CET – Computer Equipment and Trade, as an upgrade of their vocational training in the field of ICT. RAF was set-up in 2003, as a part of the Union University and focuses on information technologies and computer sciences within several programmes at Bachelor, Master and PhD level.

RAF works on two research projects: (1) Algorithms, Combinatorics, Optimisation (ACO) and (2) Signal Processing in Telecommunications, closely related to their PhD programme.

RAF publishes an electronic scientific journal entitled “e-RAF Journal on Computing”, which is available on the website: <http://joc.raf.edu.rs/>. Besides this, RAF is involved in publishing “Computer Science and Information Systems” (ComSIS), an international journal sponsored by the Ministry of Science and Technology Development of the Republic of Serbia¹¹².

“Mihajlo Pupin” Technical Faculty in Zrenjanin¹¹³: “Mihajlo Pupin” Technical Faculty in Zrenjanin was established in 1974 and in 1986 introduced computer sciences as part of the curricula. The Faculty today has 2,832 students at undergraduate and postgraduate levels, studying within six departments, one of which is the Department of Computer Sciences. The Faculty is also active in organising projects and research in computer sciences and related fields.

¹⁰⁷ More information on the Faculty of Electronic Engineering is available on the website: <http://en.elfak.ni.ac.rs>, last accessed on August 16, 2010.

¹⁰⁸ List of laboratories is available on the web-link <http://en.elfak.ni.ac.rs/laboratories>, last accessed on August 16, 2010.

¹⁰⁹ More information on the Department is available on the website:

http://www.pmf.ni.ac.rs/pmf/studije/odsek/odsek_matem.php, last visited on August 16, 2010.

¹¹⁰ More information on the FIT is available on the website: <http://www.fit.edu.rs/en/home/index.dot>, last visited on August 16, 2010.

¹¹¹ Pro Academia website: www.proakademija.rs, last accessed on August 16, 2010.

¹¹² ComSIS Journal is available at www.comsis.org, last visited on August 17, 2010.

¹¹³ More information on the Faculty is available on the website: www.tfzr.uns.ac.rs, last visited on August 17, 2010.

C.5. Institutes and Research Centres

Institute “Mihajlo Pupin”¹¹⁴: the Institute “Mihajlo Pupin” (IMP) is probably the leading research and development institution in information and communication technologies. It was established in 1946 with the mission to deliver information technology and engineering solutions, based on proven practices, innovative technologies and cutting-edge expertise. IMP has approximately 500 employees, of which 250 are researchers (including 7 university professors, 19 people with PhDs and 35 MSc graduates).

The Government of Serbia uses IMP when it comes to vital and highly sensitive projects in the domains of public safety and public finance. IMP is also involved in all government and line ministry initiatives in the fields of ICT and technological development.

IMP has a very good international cooperation capacity, proven by their rich history of working with well-known international universities, research centres and companies. In addition, IMP actively participates in international and national research and development projects, including a number funded under the FP6 and FP7 schemes.

IMP actively cooperates with the private sector in Serbia, helping to fuel growth by providing innovative technological solutions. IMP is a member of the two national clusters: Serbian Software Cluster and Embedded.rs.

IRITEL¹¹⁵: IRITEL A.D. is a private research and development institute which was established in Belgrade in 1967 and works on designing, engineering and manufacturing systems and equipment in the field of embedded industry and telecommunications. Today they have more than 200 highly educated and skilled employees. In the past few years IRITEL have established cooperation in telecommunications projects with leading domestic and well-known international companies such as: RACAL, AEG TELEFUNKEN, THOMSON CSF and LGT, ROCKWELL COLLINS, ANRITSU, SAGEM, and MPD.

D. KEY SERBIAN ICT COMPANIES

ADVANCED CONTROL SYSTEMS (ACS)¹¹⁶: ACS provides leading and innovative technological solutions in the fields of industrial automation and electrical power control systems. The company gathers engineers specialised in hardware design, embedded systems, FPGA, Linux and Java, as well as industrial automation engineering. The company is active in Serbia as well as in the international market.

ComTrade¹¹⁷: ComTrade is a provider of IT solutions and software engineering services, serving high-tech vendors, telecommunication companies, financial institutions and the public sector. ComTrade offers expertise and services in data storage management, embedded systems, network systems management, gaming, telecommunications, e-solutions and customised application development. ComTrade has more than 1,000 software engineers working in offices in Slovenia, Serbia, BiH, Ireland, Germany, Austria and the USA.

In September 2010, the ComTrade’s Technology Centre in Belgrade organised the “Knowledge Factory”, which was the largest event that brought together representatives from the private and public sector and stimulated public debate regarding the most important issues in the field of ICT.

As part of the ComTrade Group, there is **ComTrade IT Solutions and Services** (formerly Spinnaker New Technologies)¹¹⁸, a system integrator company that has been making progress on the local market through the development and implementation of turnkey ICT solutions through analysis, system design,

¹¹⁴ More information on the Institute Mihajlo Pupin is available on the website: www.imp.bg.ac.rs, last visited on August 17, 2010.

¹¹⁵ More information on IRITEL is available on the website: www.iritel.com, last visited on August 17, 2010.

¹¹⁶ More information on ACS is available on the website: www.adv-cs.com, last visited September 5, 2010.

¹¹⁷ More information on ComTrade is available on website: www.comtrade.com, last visited on September 5, 2010.

¹¹⁸ More information on ComTrade IT Solutions and Services is available on the website: www.comtrade.com/Serbia/, last visited September 5, 2010.

software development, implementation and support. ComTrade IT Solutions and Services manages the complete application development lifecycle, offering comprehensive application design, development, maintenance and support to the public sector, telecommunications companies, financial institutions and other organisations, supported by a network of regional and international offices and more than 250 engineers in Serbia alone.

ENERGODATA¹¹⁹: Energodata is a state-owned company specialised in the field of designing software solutions for the public sector, educational institutions, post offices, telecommunication companies, banks and other financial institutions. The main focus of Energodata is to develop software for e-banking and transaction systems, although they also provide solutions for e-governance, e-learning and so on. Energodata is part of the Energoproject Holding, which is internationally active across the globe.

EXECOM¹²⁰: EXECOM is a software engineering company offering a complete development cycle, from design to maintenance of complex software solutions. The company was established in 1995 in Novi Sad, Serbia. It employs 30 developers involved in design and development of IT systems primarily for telecommunication, medical diagnostics and financial enterprises. EXECOM cooperates with companies from all over the world, including the Netherlands, Germany, Austria, Italy, Hungary, Czech Republic, Slovenia, the USA, Ukraine and Russia.

INFORMATIKA AD¹²¹: Informatika is one of the leading companies in the area of application of information technology, specialised in the development, production, delivery and implementation of complex solutions to manage businesses and production processes. The Company focuses in designing and implementing information systems, computer communications and control systems, manufacturing of computer equipment and systems for automatic control of technological processes, delivery of commercial and specialised software, web services, user training and operational support systems.

Microsoft Development Center Serbia (MDCS)¹²²: The Microsoft Development Center in Serbia was established in 2005 as a small operation focused exclusively on projects related to Tablet PC technology under the name Tablet PC Development Extension. More recently the centre has intensified efforts on Tablet PC projects as well as taking on new projects unrelated to Tablet PC. It was in order to reflect this broader scope and staff expansion, that the name was changed to Microsoft Development Center Serbia. The centre collaborates with Microsoft development teams and research organisations across the world, particularly with those working in similar fields to that of Serbia.

MikroElektronika¹²³: MikroElektronika was established in 1997 as a publishing company specialised in electronics. Since then it has experienced great expansion, both in its field of domain and its range of influence. Today, MikroElektronika produces a wide range of development tools and compilers for various microcontroller families. The production facilities of MikroElektronika are equipped with true hole and SMD assembly technology. These two production lines enable the company to manufacture first class products with complete hardware and software solutions accompanied by printed manuals. MikroElektronika is an official consultant on PIC microcontrollers and a third party partner of the Microchip Company. It is also an official consultant and third party partner of Atmel, Cypress Semiconductors, NPX (formerly Philips) and the official competence centre of the Telit Company.

MINECO d.o.o.¹²⁴: Mineco is a company engaged in statistical research and analysis of the ICT sector in Serbia. They provide analysis, reports and statistical information that are widely used by both the public and the private sector. They are valuable source for any research in ICT, though

¹¹⁹ More information on ENERGDATA is available on the website: www.energodata.rs, last visited September 5, 2010.

¹²⁰ More information on EXECOM is available on the website: www.execom.eu, last visited September 5, 2010.

¹²¹ More information on INFORMATIKA is available on the website: www.informatika.com, last visited September 5, 2010.

¹²² More information on MDCS is available on the website: www.microsoft.com/scg/mdcs/default.aspx, last visited September 5, 2010.

¹²³ More information on MikroElektronika is available on the website: www.mikroe.com, last visited September 5, 2010.

¹²⁴ Mineco has provided their contacts on the website www.mineco.rs, last visited September 5, 2010.

PSTech¹²⁵: PSTech is an innovative technology company that provides fully integrated ICT business solutions and advanced software development services. The main areas of PSTech's expertise are object oriented software development and database design. PSTech also runs the biggest regional centre of excellence for software testing and their expertise includes functional testing, test automation and performance testing.

In partnership with the Bolton Trust Organisation from Ireland, Docklands Innovation Park from Dublin, and with the support of the European Bank for Reconstruction and Development (EBRD) and the TAM-BAS program, PSTech is organising the first Enterprise Development Programme, aimed at encouraging and establishing new knowledge- and technology-based businesses.

PSTech was awarded Serbia's Exporter of the Year in 2006.

SAGA¹²⁶: SAGA is one of the biggest Serbian ICT companies active in almost all fields, from computer network engineering and manufacture of computers through to system integration solutions, developing hardware and software systems, telecommunication networks and infrastructure solutions. SAGA is a partner of Sun Microsystems, Oracle, HP, Cisco, Lucent Technologies, Telecom Serbia and many others. Besides Serbia, SAGA is also present in the markets of Bosnia and Herzegovina, FRY Macedonia and Montenegro.

E. INTERNATIONAL DEVELOPMENT AGENCIES ACTIVE IN THE FIELD OF ICT

GTZ Programm für Wirtschafts- und Beschäftigungsförderung in Serbien (WBF)¹²⁷: GTZ/WBF has the goal of improving the competitiveness of small and medium-sized enterprises in selected sectors and regions and by doing so helping Serbian efforts on its way to EU membership. One of the selected sectors is the IT Software Industry, which is recognised as being one of the leading export-oriented sectors in Serbia.

The ICT industry in Serbia has been supported mainly through the support provided to Serbian Software Cluster, Embedded.rs Cluster, and recently established Vojvodina ICT Cluster. GTZ/WBF has played an important role in institutional strengthening and organisational development of these cluster initiatives. In 2010 Serbian Software Cluster and Embedded.rs has merged into ICT Net Cluster and GTZ/WBF has provided a support in this process. Besides, GTZ/WBF closely cooperates with the Ministry of Economy and Regional Development, SIEPA and the Serbian Chamber of Commerce.

GTZ/WBF has been providing support to Serbian IT software companies by supporting their participation in some of the most important trade fairs such as CeBIT, Embedded World, SYSTEMS among many others. GTZ/WBF has also been active in organising B2B events with German counterparts.

Additionally, GTZ/WBF has helped the IT software industry by publishing a catalogue "ICT Directory of Serbia 2009" on Serbian ICT companies and making an analysis of the IT sector in Serbia. German IT market analysis was also carried out as part of the GTZ/WBF project activities.

GTZ/WBF has had a significant role in introducing implementation of the CMMI quality standards within Serbian IT Companies.

USAID Competitiveness Project¹²⁸: The USAID Competitiveness Project is a four-year, \$14.7 million initiative launched in October 2007 to promote economic growth by substantially increasing the competitiveness of Serbian SMEs in leading sectors to increase sales, exports, investment and jobs. The

¹²⁵ More information on PSTech is available on the website: www.pstech.rs, last visited September 5, 2010.

¹²⁶ More information on SAGA is available on the website: www.saga.rs, last visited September 5, 2010.

¹²⁷ More information on GTZ/WBF is available on the website: www.gtzwbf.org, last visited September 5, 2010.

¹²⁸ More information on USAID Competitiveness Project is available on the website: www.compete.rs/en/sectors/ict, last visited September 5, 2010.

project identified seven sectors with the greatest potential to compete in international markets, including ICT.

Strategic focus in the ICT sector includes export promotion, local market development, and technical training and certification to strengthen the capacity of firms to compete internationally, particularly in the European Union (EU) and the Gulf Region. Strategic objectives for the sector include:

- Strengthen the capacity of local IT firms through technical training and support for obtaining key certifications;
- Facilitate local demand for IT solutions & services;
- Increase export of IT solutions & services

The key activities of the project are:

- Project Management Training Support;
- CISCO Entrepreneur Institute Training Centre Support
- IT Sector Export promotion, and
- Information Technology Upgrading Programme Support

The project has supported participation of selected Serbian software companies at 4 key global IT events: the Gitex Technology Fair in Dubai, the CeBIT Technology Fair in Hanover, Germany (2009 and 2010) and the Embedded World Fair in Nuremberg, Germany. In total, 25 companies and 2 clusters (SSC and Embedded.rs) were supported through a combination of technical assistance and grants, resulting in more than \$4 million in sales. In addition, there were 200 participants in the Project's PMP-supported training and certification programmes with 26 project management professionals certified. The CISCO Entrepreneurship Institute training programme has covered 136 participants so far.

EU Project Support to Enterprise Competitiveness and Export Promotion (SECEP)¹²⁹: SECEP is an EU IPA Technical Assistance Project, which seeks to improve the competitiveness of Serbian SMEs through three closely interlinked but distinct components:

- Cluster Development (including cluster mapping and analysis)
- Supply Chain Development and
- Internationalisation - promoting Serbian Small and Medium sized enterprises (SMEs) and developing their ability to export.

SECEP's overall objective is to support the development of a market economy and socio-economic cohesion in Serbia by improving the international competitiveness and export performance of SMEs.

Although SECEP does not directly target the ICT Sector, it has been decided that ICT Cluster(s) will be supported within their Cluster Development activities.

The ICT industry may also benefit from the other two components of the project: Supply Chain Development and Internationalisation.

The Fund for Open Society (FOS)¹³⁰: FOS has an IT programme which provides grants to public sector entities, universities and non-governmental organisations (including the media) to run projects in line with the following priorities:

- Affirming the concept of an information- and knowledge-based society as a means of rapid and sustainable development and an instrument for the openness of society;
- Creating a stimulating political, legal and social framework for the accelerated development of an information and knowledge-based society, where respect of human rights and social cohesion represent the principle characteristics, through: advocating for the adoption of appropriate policies and legislation; promoting a knowledge-based society and explaining the assumptions behind its development;

¹²⁹ More information on SECEP is available on the website: www.secep.rs, last visited September 5, 2010.

¹³⁰ More about the project might be seen at www.fosserbia.org/programs/program.php?id=201, last visited on September 20, 2010.

- Participation of the civil and business sectors in the consultative processes that define and adopt policies aimed at developing an information and knowledge-based society through, for example: the establishment and permanent work of a national ICT Forum, special ICT forums conducting debates advocating for the developmental policies of an information and knowledge-based society, aimed at establishing conditions for sustainable development, the consolidation of democracy and the further openness of society;
- Monitoring policies aimed at the development of an information- and knowledge-based society and advocating for their advancement;
- Affirming the use of information technologies as a means of freedom of expression and the digitalisation of the media, aimed at the democratisation of access to cultural and other contents, achieving and protecting the right of free choice and expression;
- Strengthening the capacity of citizens for:
 - Critical use of ICT;
 - Ethical participation in electronic communications;
 - The use of ICT with the objective of participating in public affairs: strengthening the media and IC literacy, expanding civic journalism and strengthening e-democracy.

ANNEX 2: LIST OF INTERVIEWS

Name	Organization	Place, Date and Time
Aleksandra Vladislavljevic	XAOSolutions d.o.o	Belgrade, May 19, 2010 at 10:30AM
Srdjan Shami	MASS Vision d.o.o.	Belgrade, May 19, 2010 at 11:45AM
Dr. Vojin Senk	Faculty of Technical Sciences, University of Novi Sad	Belgrade, June 14, 2010 at 11:00 AM
Djordje Celic	Business Incubator, Novi Sad	Novi Sad, June 14, 2010 at 11:00 AM
Milan Solaja	Vojvodina Investment Promotion Fund	Novi Sad, June 14, 2010 at 1:00 PM
Valentina Ivanic	Vojvodina CESS	Novi Sad, June 14, 2010 at 1:00 PM
Vukasin Pejovic	Embedded.rs Cluster,	Belgrade, July 2, 2010 at 11:00 AM
Vita Latinovic - Nenadic	SECEP	Belgrade, July 2, 2010 at 3:00 PM
Uros Tomanovic Milan Stancic	Advance Control Systems	Belgrade, July 5, 2010 at 12:30 PM
Andrija Bednarik	SIEPA	Belgrade, July 5, 2010 at 3:00 PM
Gordana Danilovic – Grkovic	Business Technology Incubator of Technical Faculties of University of Belgrade	Belgrade, July 6, 2010 at 1:00 PM
Vladimir Topalovic	Serbian Software Cluster	Belgrade, July 6, 2010 at 3:00 PM
Milan Solaja (VIP) Branislav Djukic (Intens d.o.o.)	Vojvodina ICT Cluster	Novi Sad, July 7, 2010 at 11:00 AM
Jelena Jovanovic	Serbian Chamber of Commerce	Belgrade, July 13, 2010 at 10:00 AM
Zorica Maric	Ministry of Economy and Regional Development	Belgrade, July 14, 2010 at 10:00 AM
Irena Posin Stefan Lazarevic Natalia Radosevic Marko Ivancevic	Ministry of Telecommunications and Information Society	Belgrade, July 28, 2010 at 10:00 AM

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