



*Faculty of Economics, University of Niš, 17 October 2014*

International Scientific Conference

**THE FINANCIAL AND REAL ECONOMY:  
TOWARD SUSTAINABLE GROWTH**

---

**POTENTIALS AND PERSPECTIVES OF DEVELOPMENT  
OF THE IT SECTOR IN SERBIA**

**Vladimir Dinić\***

***Abstract:** The aim of this paper is to highlight the potentials for the development of the IT sector in Serbia, the necessary reforms and possible directions for future development. Despite the fact that the IT sector is one of the fastest-growing in Serbia, its potentials are not fully exploited. Because it is a profitable and propulsive sector that could have a positive influence on the economic growth and the development of other sectors, its future development should be set as a priority. First of all, it is necessary to increase the amount of investment in this sector and implement a variety of incentives. Also, it is desirable to encourage the formation of a large number of IT development centers, clusters and other forms of associations. Finally, it's important to carry out a series of regulatory changes and other reforms in order to create better conditions for increasing the competitiveness of this sector.*

***Keywords:** IT sector reforms, development, competitiveness*

**1. Introduction**

IT (information technology) sector, as a subsector of ICT (“Information and communication technology”) sector, is one of the most propulsive sectors in every national economy. Therefore, growth and development of IT sector is considered as one of the most important strategic objectives for every country. For example, Japan, UK, China and EU have defined information technologies as one of the national science priorities (Government of the Republic of Serbia (c) 2010, 19-20). Development of IT sector is important not just in sense of creating information society, but also in terms of creation, growth and development of computer hardware and software industry, as well as other supporting industries which could significantly affect development of other sectors and overall economic growth and development. We need to mention that ICT sector is generally split into IT sector and telecommunication sector. Those subsectors are interdependent, but focus in this study will be on IT sector, while telecommunication sector will be observed only in sense of IT infrastructure.

---

\* PhD student, University of Niš, Faculty of Economics, Serbia; a scholar of the Ministry of Education, Science and Technological Development of the Republic of Serbia;

✉ vladimirdinic88@gmail.com

UDC 007:004(497.11)

In this paper, we will analyze the state of Serbian IT sector and point out the possible ways to exploit all potentials for this sector development. First, we will give an introduction to the general characteristics of Serbian IT sector. Then, in the next chapter we will analyze legal and technical infrastructure and try to find out bottlenecks and ways to remove them in order to foster further development of IT sector. In the next chapter, we give the overview of fiscal policy in Serbia directed toward IT sector and propositions how to support this sector using fiscal policy in accordance with the current state of this sector. Under the same chapter, we analyze investments in Serbian IT sector in order to indicate the need for increasing the amount and changing the structure of investments in IT sector in Serbia. Further, we analyze human resources as probably the most important factor for IT sector development, i.e. number of students at IT-related university programs, number of IT professionals, their educational level, skills, “brain drain” and other problems related to human resources in IT sector in Serbia. In the next chapter, we analyze the role of IT clusters, technology parks and other forms of associations in development of IT sector in Serbia. Finally, in the conclusion, we will summarize previous observations and propose directions for future development of this sector.

## 2. Basic Features of IT Sector in Serbia

IT sector is relatively new sector, but it represents an important generator of economic activities. “In EU ICT sector is directly responsible for 5% of European GDP. The indirect effects of ICT sector are particularly reflected in the overall productivity growth (20% directly from the ICT sector and 30% of investments in ICT)” (Katić, Milošev, Raletić 2013, 299). This is just one of many indicators which shows benefits of strong IT sector and need for fostering the development of this sector. Development of this sector could have a series of positive effects on national economy like increase of export revenues and level of competitiveness of the entire national economy, etc.

IT sector in Serbia in short could be described in the following few sentences. It is young and growing sector, but also very adjustable to new conditions on local and global markets. There is a good talent base in Serbia for this sector, which is composed of young and ambitious graduated professionals with good knowledge of English language and other useful skills. On the other hand, a lot of those IT professionals don't have sufficient relevant experience, there is no intensive cooperation between universities and companies, investments in this sector are relatively small and this sector isn't adequate regulated by law. By using all potentials and removing or mitigating various obstacles, the IT sector in Serbia could become one of the generators of further economic growth and development.

Analyzing basic features of Serbian IT sector requires a detailed analysis of individual factors, like legal and business environment, infrastructure, government policy directed towards IT sector, available human resources and their structure and a lot of other factors. Analysis of Serbian IT sector we could start with numerical evaluation of state in Serbian ICT sector in “The Global Information Technology Report 2014”. This document gives us estimated values of some of the most important indicators of political, regulatory, business and innovation environment, skills, individual, business and government usage of ICTs, and a lot of other indicators. According to estimated values of analyzed indicators in this report, Serbia is, in general, a relatively low ranking country in many aspects related to ICT, as we can see in this table:

## Potentials and Perspectives of Development of the IT Sector in Serbia

**Table 1: Basic indicators of ICT sector in Serbia**

Indicator	Assessed value	Ranking
The Networked Readiness Index 2014	3.88 (3.7 in 2013)	80/148 (87/144 in 2013)
<b>Political and regulatory environment</b>		
Laws relating to ICTs	3.4 (on scale from 1 to 7)	103/148
Intellectual property protection	2.9 (on scale from 1 to 7)	115/148
Software piracy rate	72 %	72/108
<b>Business and innovation environment</b>		
Availability of latest technologies	4.1 (on scale from 1 to 7)	118/144
Total tax rate	36,8 %	73/148
Number of days required to start a business	12	62/148
Number of procedures required to start a business	6	58/148
Intensity of local competition	3.8(on scale from 1 to 7)	138/148
<b>Skills</b>		
Quality of the educational system	3.1 (on scale from 1 to 7)	111/148
Quality of math and science education	4.3 (on scale from 1 to 7)	55/148
<b>Individual usage</b>		
Mobile telephone subscriptions (post-paid and pre-paid) per 100 population	117.9	55/148
Percentage of individuals using the Internet	48,1 %	67/148
Households with a personal computer	60,3 %	53/147
Percentage of households with Internet access at home	40,2 %	57/148
<b>Business usage</b>		
Business-to-business Internet use	4.3 (on scale from 1 to 7)	112/148
Business-to-consumer Internet use	3.8 (on scale from 1 to 7)	109/148
<b>Government usage</b>		
Government success in ICT promotion	3.4 (on scale from 1 to 7)	128/148
Importance of ICTs to government vision of the future	3.2 (on scale from 1 to 7)	120/148

Source: WEF (2013) The Global Information Technology Report 2014.  
[http://www3.weforum.org/docs/WEF\\_GlobalInformationTechnology\\_Report\\_2014.pdf](http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf)  
 (10.07.2014)

Based on these indicators, we could make a conclusion that:

- The Networked Readiness Index (NRI) is indicator which measures the capacity of national economies to exploit the advantages offered by the use of ICT. Serbia's NRI is 3.88 and NRI ranking is relatively low, 80/148, but it is still improvement in comparison to 2013, when NRI was 3.7 and NRI rating was 87/144. Probably the most important cause of relatively low NRI is insufficiently developed ICT infrastructure and ICT uptake and weak innovation systems that hamper its capacity to fully leverage ICTs to boost competitiveness (WEF 2013, 19-20).
- Laws related to ICT sector are inadequate, and there is low level of intellectual property protection and high software piracy rate. Those factors could represent obstacles for further development of IT sector, so government should pay attention to regulatory issues.
- Total tax rate and number of days and number of procedures required to start a business are relatively small, which is favorable for doing business in IT sector in

Serbia. On the other hand, intensity of local competition and availability of latest technologies are at very low level, which could hinder innovations in this sector.

- Quality of educational system in Serbia is, in general, estimated very low, but quality of math and science education is relatively high, which is of big importance for creating IT and other professionals.
- Individual usage of mobile phones is very high, but usage of personal computers and Internet in households is relatively low. Those indicators could be very useful as a guideline for new IT businesses. For example, those indicators maybe could lead us to the conclusion that developing mobile applications for domestic market could be good business move. „This domain (market for mobile applications) is particularly relevant in low-income countries in which the current use of computers remains limited while mobile phone use is booming“ (UNCTAD 2012, xvi).
- Business usage of ICTs is very low. This information could also be very useful, because it could mean that corporate sector is large market segments that yet has to be won by Serbian IT companies.
- Those indicators also show that Serbian government doesn't show great interest in the IT sector development. “In many developing and transition economies, the public sector represents a key part of domestic software demand. Its procurement of software products and services is often linked to tenders for large-scale e-government projects. Beyond being an important creator of domestic demand, the public sector can also play a catalytic role in spurring innovation through public procurement related to e-government, e-health and e-learning” (UNCTAD 2012, 14). Government demand for IT products could be very important for boosting IT sector, especially in case of households' weak purchasing power.

This was just a short overview of basic features and indicators of Serbian IT sector. Since there are a lot of factors Detailed insight into legal and technical infrastructure in Serbia, investments and fiscal incentives in IT sector, as well as labor force in Serbian IT sector, since the human factor is maybe the most important for this sector development.

### 3. Legal and Technical Infrastructure

When we are talking about legal aspects of doing business in IT sector, we need to mention that “doing business in telecommunications is better regulated than in the IT sector. Doing business in the IT sector has more difficulties: mostly due to low specialization, limited turnover and issues tied to regulations (export, VAT and customs)” (Matijević, Šolaja 2013, 14). During the previous years, Serbian Parliament has passed several laws that are more or less related to IT sector. For example, we could mention “Law on Organization and Jurisdiction of Government Bodies in Combating High Tech Crime” adopted in 2005. “This Law regulates the establishment, organization, jurisdiction and powers of special state organs for detecting, prosecuting and trial for criminal acts in which as an object or a tool for criminal acts appear computers, computer systems, computer networks, computer data, as well as their products in the material or electronic form” (Government of the Republic of Serbia (a) 2005). We could also mention “Law on Copyright and Related Rights”, adopted in 2009, which aim is, inter alia, to protect IT companies from piracy, i.e. unauthorized copying, distribution and selling of their software products, databases and other copyrighted works.

## **Potentials and Perspectives of Development of the IT Sector in Serbia**

---

There are also a lot of different laws which are only partially related to the IT sector, because they regulate secondary activities of IT companies. Examples of those laws are “Law on Electronic Signature”, which is adopted in 2004, and “Law on electronic commerce” and “Law on Electronic Document”, which are adopted in 2009. Further, we could mention “Law on Telecommunications” adopted in 2003 and “Law on Electronic Communications”, adopted in 2010, which regulate telecommunication sector in Serbia, but also indirectly and partially IT sector, in sense of telecommunication infrastructure.

On the other hand, Serbia doesn't have “Law on electronic money”, which is, for example, in force in Croatia since January 1<sup>st</sup> 2011. Further, National Bank of Serbia has prepared a “Draft Law on Payment Services”, which, inter alia, “creates unique and comprehensive set of rules for rendering payment services in the Republic of Serbia and establishes conditions for improved efficiency of payment operations, better protection of users of payment services and improvement of competition in the payment services market. At the same time, the Draft Law ensures alignment with the acquits of the EU in the area of payment services, electronic money and the finality of settlement in payment systems.” (Nbs.rs (a) 2014). This draft law has not yet been adopted. The importance of e-money and payment systems lies in fact that e-payment systems like PayPal and similar are one of the most common and the most suitable ways for IT companies to receive a payment for provided services and sold goods through the Internet. Since recently, Serbian residents didn't have a possibility to use PayPal. Thanks to the changes in the “Law on Foreign Exchange Operations” made in 2012, our residents have got opportunity to use PayPal services since April 2013 (Nbs.rs (a) 2014), although Serbia is one of the last countries in the world where PayPal have become available. Today, it is possible to have PayPal account in Serbia and to buy goods and services using PayPal, but Serbian IT companies still don't have opportunity to use PayPal to receive payments for their goods and services.

Besides laws, we could mention some of development strategies of Republic of Serbia within which is defined the desired direction of development of the IT sector in Serbia. The most important of them are “Industrial Development Strategy and Policy 2011–2020”, “Strategy on Science and Technological Development of the Republic of Serbia in period 2010-2015” and “Information Society Development Strategy in the Republic of Serbia until year 2020”. Under the “Strategy on Science and Technological Development of the Republic of Serbia in period 2010-2015”, IT sector is identified as one of the seven national priorities (Government of the Republic of Serbia (c) 2010, 20). However, although policy makers in Serbia have formally shown the understanding of importance of IT sector development and intention to foster that development, a lot of indicators show that there are still a lot of potentials for this sector development which aren't exploited. IT sector in Serbia. Regardless of previous results in this sector, government support is more than welcome.

Further, under the “Industrial Development Strategy and Policy 2011–2020”, it is stated that “ICTs are the main growth driver of the global economy in this century. From classical electronic industry, the focus has meanwhile been shifted to the software and the industry of computer and telecommunications services, and most of the added value is generated just in the area of software and services (computer and telecommunications). Price of computer hardware and telecommunication equipment, is very low because of production line, so job creation in this sector doesn't require big investments” (Government of the Republic of Serbia (d) 2011, 91). Serbian IT sector is relatively well developed. For example, according to some sources, export of IT services in 2011 was around 200 millions

USD (SIEPA 2012, 4), which is about 0.462% of Serbian GDP. In comparison to other countries it is relatively high ratio (UNCTAD 2012, 118-121), which indicates a large export potential of Serbian IT sector and high level of competitiveness of Serbian IT companies. Meanwhile, good results of Serbian IT sector are primarily result of private initiative. The fact that Serbian IT industry is successful doesn't mean that there is no need for new investments in this sector and other incentives. As we will see below, investments in Serbian IT sector are relatively much lower than in majority of European countries.

When we are talking about infrastructure issues, "although the quality of Serbian ICT infrastructure is below the level of EU countries, it is improving with every year, while past few years saw significant advancements. In addition, the quality of ICT infrastructure itself does not present significant obstacles for business in Serbia since the most of the ICT companies are concentrated in Belgrade, Novi Sad and to some extent Niš, where the quality of ICT infrastructure is significantly higher than in the other parts of Serbia" (Matijević, Šolaja 2013, 13-14). Since the Serbian IT industry is concentrated in three cities - Belgrade, Novi Sad and Niš and more than 50% of all companies are in Belgrade (SeeNews 2012, 3), such distribution of Serbian IT companies could be assessed negative in terms of regional development disparities.

"The fact that Serbian ICT access indicators have significantly higher values (0.68) than ICT use indicators (0.32) is quite apparent and serves as an illustration of the disparity between the existing telecommunications infrastructure capacity and the use of such capacity in terms of telecommunications services transmitted by such infrastructure in Serbia, as is the case with the use of broadband Internet services. ICT skills indicators (0.73) are of the appropriate value" (Matijević, Šolaja 2013, 22). In other words, ICT infrastructure is relatively satisfying, but insufficiently used for development of IT sector.

#### **4. Investments in the IT Sector and Role of Fiscal Policy in IT Sector Development**

There are a lot of reasons why investing in IT sector is a smart decision. Some of the most important reasons are the facts that IT sector could initiate development of many other sectors and prevent "brain drain", that it requires relative small investments in comparison to other sectors, but is more profitable than most of them, etc. According to some sources, with no clear indication to which year or period it refers, "IT investments in Serbia are below 1% of GDP, while EU standards are 2-3% of GDP" (Matijević, Šolaja 2013, 24). That means that IT investments in Serbia are approximately or below 400 million USD, so if we want to achieve European level, investments in IT should be between 800 million USD and 1.2 billion USD.

A lot of policy makers believe that foreign direct investments (FDI) are the best way to revive a weak economy. On the other hand, "from the perspective of local companies operating in ICT sector, FDI are seen more as a threat than as a benefit, due to the limited human resources available on the market. In fact, foreign companies tend to attract good ICT experts with higher salaries, often leaving national companies in the situation where they cannot compete. However, we have diminished FDI inflows in Serbia, generally caused by decelerated process of joining the EU, the global financial crisis, bureaucratic and insufficiently reformed public administration and a high level of corruption" (Matijević, Šolaja 2013, 11-13). Although corporate tax rate was 10% (today

## **Potentials and Perspectives of Development of the IT Sector in Serbia**

---

corporate tax rate is 15%), obviously it wasn't sufficient stimulant for attracting FDIs. Further, in a lot of cases FDIs are just instrument for exploiting financial incentives and inexpensive labor force which don't have positive impact on other domestic companies and industries. Therefore, policy of attracting FDIs must take into account all the positive and negative effects of financial and other incentives to attract them

We can say that our current fiscal policy isn't well adjusted to sectors like IT. For example, according to Corporate profit tax law in Serbia, "any taxpayer that invests more than 1 billion dinars in its fixed assets or such amount is invested in its fixed assets by another person and uses such funds in the conduct of its main line of business and lines of business entered in the taxpayer's founding document or in some other taxpayer's document identifying the lines of business conducted by the taxpayer and employs during the investment period at least additional 100 persons for an indefinite period of time, shall be exempt from corporate profit tax for a period of ten years, in proportion to that investment" (Tax Administration of Serbia (b) 2013). On the other hand, according to 2011 data, Serbia has about 1.704 IT companies with 9 full time employees on average. It is important to notice that there are only 4 big companies with more than 250 employees (0,2% of all IT companies), and about 2,3% of medium enterprises, 14,3% of small enterprises and 83,2% of micro enterprises, Large number of micro companies with low financial resources, insufficient technological and managerial skill and relatively small number of small and medium companies could make a big obstacle for growth and development of this sector (Matijević, Šolaja 2013, 28). If we take into account the fact that more than 99% of all Serbian IT companies are micro, small or medium enterprises, previously mentioned incentives are just useless for this sector.

If we want to stimulate IT sector in Serbia, fiscal incentives have to be directed towards all companies whatever their size is, or requirements for fiscal incentives should be less stringent. Today in Serbia, amortization rate for personal computers and system and applicative software is 30% (Tax Administration of Serbia (a) 2010), which can be assessed as favorable. Good examples of fostering IT sector we can find in a lot of other countries. For example, in Brazil "Computer Tax Incentive Law" allows companies to invest in research and development projects (previously approved) rather than pay these funds as income taxes. This measure strongly bolstered the creation of new software companies and also attracted new companies to Brazil that produce computer goods in several regions of the nation today (Audy, Carmel, Prikladnicki 2010, 81). Using foreign experience in fostering IT sector could be a good way to define optimal incentive policy.

Further, we should estimate potential effects of using various fiscal policy instruments in long term, not only from the IT sector perspective, but from the perspective of whole economy development. In fact, boosting IT sector, as one of the most propulsive in almost every economy, could revive many other sectors and result in lower unemployment and better standard of living. In long term we could have greater tax base, so implicit tax loss caused by lower tax rates or other fiscal incentives could be more than covered by tax income from all sectors.

Further, one of the crucial drivers of the IT sector is demand. VAT on personal computers and their components since January 1, 2014 was 8%. After fiscal reforms, it is 20%, which means effective price increase of about 11,1%, so it must have had negative impact on demand for computers and their equipment, and indirectly on IT services. Statistical data for 2013 show that 59,9% of households in Serbia have home computer and

55,8% of them have Internet access (Statistical Office of the Republic of Serbia (c) 2013). It is much lower than 79% of households in OECD countries or 76,7% in EU-27 countries that have access to a home computer, and much lower than 74,9% of households in OECD countries and 73,2% in EU-27 countries, according to 2011 data (OECD Library 2013). If government had wanted to raise these indicators and to give even a small incentives to IT sector, it shouldn't has had to raise VAT on these goods. At the very least, even if reduced VAT rate on personal computers couldn't foster IT sector growth, it could have positive effects on raising computer literacy. On the other hand, raising level of computer literacy could have positive influence on demand for IT products.. 2011 population census shows that only 34,21% of population is computer literate, 14,78% of population are persons with partial computer skills and more than 50% (51,1%) of population are computer-illiterate persons. Finally, we could estimate that reduced demand for computers induced by higher VAT rate could slow down the development of information society in Serbia, as one of the most important strategic objectives. In other words, development of the information society should be directed to the exploiting the potential of ICT to increase efficiency, economic growth, higher employment and improved quality of life for all citizens of the Republic of Serbia (Government of the Republic of Serbia (b) 2010, 1).

## 5. Education and Labor Force in Serbian IT Sector

ICT (Information and communications technology) is one of the industries with greatest development potential in Serbia, which can positively influence all other economic sectors. The double-digit annual growth has turned ICT into one of the sectors with highest export potential. One of the most crucial factors in IT sector development are human resources. It is also maybe the most important growing factor for IT sector development in Serbia. IT sector in Serbia has almost 0% unemployment rate and the salaries in the sector are the most attractive. According to some estimates from July 2014, 16 of 50 most sought after jobs in Serbia are in IT sector, while top five most sought after jobs are also in IT sector (Mpn.gov.rs 2014).

Serbia has the highest percentage of English speaking working population (49%) in the SEE region. The cost competitiveness of engineers is another advantage of doing business with or from Serbia, because IT specialists earn more than average in Serbia, but less than their European colleagues (SIEPA 2012, 10-11). On the other hand, one of the most important limiting factor to the IT sector growth and development is "brain drain", which causes the shortage of qualified human resources. It is important to emphasize that IT sector could attract skilled young people and reduce brain drain. Statistical data show that national shares of employment in IT sector ranges from 0,1% to 2,2% of total employment. That share is, generally, lower in developing countries than in developed ones (UNCTAD 2012, 21). According to 2011 data, number of employees in Serbian IT sector is 14.876 (Matijević, Šolaja 2013, 29). On the other side, total number of employees in Serbia in 2011 was 1.746.138 (Statistical Office of the Republic of Serbia (a)). According to that, share of number of employees in IT sector in total employment is about 0,8%. That share can be assessed as acceptable, but we mustn't forget two important facts:

- It is just much lower than that share in the EU where it is 1,5%, or Switzerland where is above 2% (UNCTAD 2012, 21). For comparison purposes, Switzerland has only 10% bigger population than Serbia (about 8.000.000), and about



## Potentials and Perspectives of Development of the IT Sector in Serbia

4.000.000 employees (Swiss Statistics Web site). It leads us to conclusion that Switzerland (with similar population to Serbia) has about 80.000 IT professionals, i.e. almost 5 times more than Serbia.

- Serbia has high unemployment rate of 26,1% (UNDP.org), so we could estimate that real share is lower than 0,8%. In other words, even if we want to achieve just average EU level of 1,5 %, even in case of this high unemployment rate in Serbia, we will need to have more than 26.000 IT professionals in IT sector, i.e. about twice than we have now.

Despite the relatively well educated workforce (technical skills and languages), and the lower labor costs than in Western Europe, Serbian ICT sector needs improvement in University education, investments in R&D, introduction of new technologies.” (USAID 2013. 2). For example, according to 2009 data, 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. Further, 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 (Kappenmann, Mijačić, Sredojević 2011, 24-25).

Today, there are about 35 higher education institutions in Serbia which offer ICT related academic programs. Some data sources show that universities in Serbia have produced 3.637 new ICT professionals during 2011 (Matijević, Šolaja 2013, 37-39). Data source from several years ago show that institutions of higher education in Serbia had been producing less than 500 graduated students in ICT sector annually (Government of the Republic of Serbia (b) 2010, 21). In other sources we could find an estimation of 1.500 new professionals in IT sector annually (SIEPA 2012, 10-11). Data on new IT professionals in Serbia differ from source to source, and differences are most probably often caused by the fact that researchers have used data from different years, and by the fact that some estimates have probably included professionals in telecommunication sector (in case of total ICT sector) or other related professionals like mathematicians (although they could be of great importance in software development) or similar.

If we use official data from Statistical Office of the Republic of Serbia, and include only IT related graduates like engineers of electrical engineering and computer science and IT Specialist, we can get estimated number of new graduates in IT sector from universities in Serbia which are shown in Table 2.

**Table 2: Number of graduates in IT sector in Serbia**

Higher education level	Year				Average
	2009	2010	2011	2012	
I level (Bachelor level)	1312	1092	981	839	1056
II level (Master level)	970	1987	1866	1944	1692
III level (PhD level)	42	21	29	26	30
Total	2324	3100	2876	2809	2777

*Source:* Statistical Office of the Republic of Serbia (b), author performed computations

Based on this data, we couldn't make accurate estimate of number of new IT professionals in Serbia. All what we could conclude is that average annual number of new IT professionals in Serbia (excluding professionals in telecommunication sector, mathematicians and similar professions) is definitely higher than 1.000, but most probably much lower than

2.777, because every IT professional who completed master or PhD studies had already completed bachelor studies in earlier period. Further, we could notice growing share of new master level graduates in total number of new graduates in Serbia every year (from 41,7% in 2009 to 69,2% in 2012), which tells us about the increasing level of education of IT professionals in Serbia and their interests to build and develop new skills. On the other hand, we have to stress the fact that this period (2009-2012) is the period when among graduates we can find both graduates who were studying according to pre-Bologna and according to Bologna education system, so it is not clear how pre-Bologna graduates have been included in analysis. If we assume unchanged unemployment rate and absence of brain drain, and if we accept, for example, previous mentioned number of 1.500 new professionals in IT sector annually as a relevant estimation, we will need about 8 years to achieve earlier mentioned share of number of employees in IT sector in total employment in EU of 1.5%. In turbulent sector like IT 8 years is very long period. In that sense, we could also stress the fact that there is growing interest in studying IT related academic programs. Therefore, government should find a way to encourage these future and present IT professionals to stay in Serbia. Since "brain drain" reduces not just the quantity, but also the quality of Serbian IT labor force, we will need to slow down that process, primarily through greater investments in education and through encouraging the foundation of new IT companies and facilitating and stimulating already existing IT businesses.

## **6. The Role of IT Clusters, Technology Parks and Other Forms of Associations on IT Sector Development**

The fact that most of Serbian IT companies are micro, small or medium enterprises leads us to find a way to foster their foundation and provide them legal, financial and other services necessary for making the first steps in real business environment. Therefore, there are several forms of assistance and support to small and new companies

One of the most common way to help small companies to expand their businesses are ICT/IT clusters. Cluster represent a group of geographically concentrated companies which are interdependent firms, which are competing to each other, or which products are complements. The main goals of every cluster are mutual cooperation, better use of available infrastructure, technology and other resources, increasing of competitiveness, joint activities, enforcing cooperation with development centers, various funds, and other benefits of economies of scale. In Serbia there are 4 ICT clusters: "ICT Network" from Belgrade, "Vojvodina ICT Cluster" from Novi Sad, NiCAT – "Nis Cluster of Advanced Technologies", from Niš and "ICT cluster of central Serbia" from Kragujevac. Every of these clusters has its own organization and other specificities, but all of them are dedicated to fulfilling the objectives of entire cluster. It is reasonable to expect that a lot of companies which aren't yet, are going to become members of those clusters in order to exploit benefits which ICT clusters offer to them. ICT clusters in Novi Sad and Belgrade were founded in 2010, ICT cluster in Niš was founded in Niš in 2012, and ICT cluster in Kragujevac was founded last year, in 2013, which means that ICT clusters are new form of association in our country, but which rapidly spread and developed accross our country. Since the IT sector is a fast-growing sector, we can expect an increase in the number of members or existing clusters or possibly even the establishment of new clusters in the future. On the other hand, we can notice the increasing desire of existing clusters for mutual cooperation (Ict-cs.org 2014).

## **Potentials and Perspectives of Development of the IT Sector in Serbia**

---

In order to show the basic features of a ICT cluster, we will present ICT cluster from Niš in several sentences. NiCATs mission is to provide companies and community with high class services in the area of professional trainings, standardization, national and international marketing and lobbying in order to increase competitiveness in the field of advanced technologies. Main goals of this cluster are: increase of the turnover of the cluster members both on national and international market, strengthening of the capacities of the companies for technological development and innovations and the development of new technological products and services, as well as promotion of the City of Niš as a favorable location for business operations in the advanced technology field. This cluster is connected to 2 research institutions such as Faculty of Electronic Engineering and Faculty of Mechanical Engineering of University of Niš, and 3 economical development support institutions: Regional Development Agency ORA JUG, Regional Chamber of Commerce and Business Incubator Niš (Ni-cat.org). As we can see, ICT clusters could be very complex associations which incorporate various types of companies, research institutions and economical development support institutions. If these clusters realise their own objectives, we could expect greater role of ICT clusters in increase level of competitiveness of Serbian IT sector.

On the other hand, new companies very often need help and assistance to start business, in which they can get assistance from business incubators. The importance of business incubators lies in fact that most of the new companies don't have enough experience and human resources, both in the field of finance and accounting, as well as in the field of law and other activities without which it is not possible to do business. Today there is a business incubators in almost every bigger city in Serbia. Those business incubators aren't focused on companies in one sector, but there are a lot of new companies in IT sector who are their clients.

We could also stress the importance of formation and development of technology development parks in the field of information technology. Theses parks provide an environment for mutually beneficial collaboration of research and development (R&D) among tenants in the park, and with academia in the case when they are university based. Such parks have been considered one model for promoting innovation, entrepreneurship, growth of knowledge-based companies and in turn economic growth within their region. By the way, technology parks have played a crucial role in the growth of the software sector in India (Vaidyanathan 2008).

In that sense we could mention technology park in Zvezdara, IT park in Inđija, science-technology park in Čačak, technology park in Kragujevac and technology park in Niš. The most of them are still under the process of foundation, or their foundation is just announced, without any concrete step towards establishing. For example, science-technology park in Čačak is relatively new, and it currently has 2 IT companies as its clients (Ntpcacak.rs). On the other side, Embassy Techzones IT Park in Inđija is still under construction. The building of the park is planned to be done in 3 phases. The first phase was finished last year, while the second phase incorporates the construction of the University of Information Technology. IT Park Inđija is designed as a business support to the development of companies that are based on innovation and knowledge. It provides an environment in which large, global corporations can establish specialized centers for technology development (IT park Inđija official site). Further, the building of technology park in Niš is planned to be finished in 2015 (Piu.rs), while the building of technology park in Zvezdara was finished last year, but there is no new information about the launching its

activities. The foundation of technology park in Kragujevac is just announced, but there is no available any information about the current phase of establishment process.

## 7. Conclusion

Information technology sector is relatively new, but one of the fastest-growing and very dynamic sector with a significant impact on growth and development of other sectors and entire national economy. In Serbia, IT sector is, in general, export-oriented, which means that it is very competitive. Labor force in this sector is, in general, young, educated, and there is growing interest for studying IT related university programs. ICT infrastructure which provides possibilities for doing business in this sector is relatively developed, at least in Belgrade, Niš and Novi Sad. Since the human factor is one of the most important for development of IT sector, and IT infrastructure is relatively acceptable, Serbia has great potentials for further development of this sector.

On the other hand, number of IT professionals in Serbia is relatively low in comparison to other European countries, and there is a big problem of “brain drain”. Further, the usage level of ICT infrastructure is relatively low. On the other hand, distribution of quality ICT infrastructure implicitly imposes development of new companies in this sector only in big cities like Belgrade, Niš, Novi Sad and several others, so government should pay more attention to regional aspect of this direction of development. There are also a lot of regulatory issues that have to be solved, primarily related to e-money services, which are of big importance for companies to receive payments for their goods and services, so announced “Law on Payment Services” or similar act related to e-money and payment services should be passed as soon as possible. Further, a lot of strategic development documents show the government’s intention to foster development of this sector, but on the other hand we could say that government doesn’t foster the development of this sector adequately. It is of big importance, although IT sector is successful in general, if we want this sector to be more competitive. For example, some of fiscal incentives are directed towards big companies, so development of IT sector, which is characterized by a large number of small companies, is ignored to a certain extent.

Further, investments in Serbian IT sector are relatively small in comparison to other European countries, so government should encourage investments in this sector. On the other hand, government could have a great role in development of this sector as a consumer of domestic IT solutions, since public sector could generate high demand in this sector. We could also mention that there is no strong connection between universities and IT companies, except some cases of associations like ICT clusters. This is one of the reasons why foundation and growing importance of IT clusters and other forms of associations should be set as one of priorities. Some of other reasons are fostering innovations, using effects of economics of scale, etc. Clusters, business incubators and technology parks are relatively new concepts in our country, but their positive effects have been proven in many other countries, so government should invest more effort to foster their foundation and support their activities. We believe that IT sector will remain one of the most important export sectors, with growing importance and positive impact on performance of the national economy and one of the most competitive. But if we want to get the most from this sector, we should encourage its further development.

References

1. Government of the Republic of Serbia (a) (2005) *Law on Organization and Jurisdiction of Government Bodies in Combating High Tech Crime*, [http://www.paragraf.rs/propisi/zakon\\_o\\_organizaciji\\_i\\_nadleznosti\\_drzavnih\\_organana\\_za\\_bo\\_rbu\\_protiv\\_visokotehnoloskog\\_kriminala.html](http://www.paragraf.rs/propisi/zakon_o_organizaciji_i_nadleznosti_drzavnih_organana_za_bo_rbu_protiv_visokotehnoloskog_kriminala.html) (11.07.2014)
2. Government of the Republic of Serbia (b) (2010) *Information Society Development Strategy in the Republic of Serbia until year 2020*, [http://digitalnaagenda.gov.rs/media/docs/strategija\\_razvoja\\_informacionog\\_drustva\\_u\\_republici\\_srbiji\\_do\\_2020-\\_godine.pdf](http://digitalnaagenda.gov.rs/media/docs/strategija_razvoja_informacionog_drustva_u_republici_srbiji_do_2020-_godine.pdf) (11.07.2014)
3. Government of the Republic of Serbia (c) (2010) *Strategy on Science and Technological Development of the Republic of Serbia in period 2010-2015* .
4. Government of the Republic of Serbia (d) (2011) *Industrial Development Strategy and Policy 2011–2020*.
5. Piu.rs, *Science and Technology Park in Nis*, <http://www.piu.rs/projects.php?id=23> (10.07.2014.)
6. Tax Administration of Serbia (a) (2010) *Pravilnik o načinu razvrstavanja stalnih sredstava po grupama i načinu utvrđivanja amortizacije za poreske svrhe*, <http://www.poreskauprava.gov.rs/pravna-lica/pregled-propisa/pravilnici/320/pravilnik-o-nacinu-razvrstavanja-stalnih-sredstava-po-grupama-i-nacinu-utvrđivanja-amortizacije-za-poreske-svrhe.html> (11.07.2014.)
7. Tax Administration of Serbia (b) (2013) *Zakon o porezu na dobit pravnih lica*, <http://www.poreskauprava.gov.rs/sr/pravna-lica/pregled-propisa/zakoni/307/zakon-o-porezu-na-dobit-pravnih-lica.html> (11.07.2014.)
8. USAID (2013) *ICT Country Profile Serbia 2013*, [http://www.rciproject.com/itprofiles\\_files/ICT\\_Country\\_Profile\\_Serbia\\_2013\\_1.0.pdf](http://www.rciproject.com/itprofiles_files/ICT_Country_Profile_Serbia_2013_1.0.pdf) (09.07.2014)
9. Audy, J. L. N., Carmel, E., Prikladnicki, R. (2010) Global software engineering and the Brazilian perspective. *Journal of the Brazilian Computer Society*, 16(2): 81-82
10. Ict-cs.org (2014) *Potpisivanje sporazuma o saradnji ICT CS-a sa tri klastera Srbije*, <http://ict-cs.org/svecano-potpisivanje-sporazuma-o-saradnji-ict-cs-a-sa-tri-regionalna-klastera-srbije/>
11. IT park Indija official site, <http://www.embassytechzones.rs/> (12.07.2014.)
12. Kappenmann, J., Mijačić, D., Sredojević, M. (2011) *ICT in Serbia - At a Glance*, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), GmbH Program for Private Sector Development in Serbia ACCESS, Vojvodina ICT Cluster, [http://www.lokalnirazvoj.org/upload/Publication/Document/2011\\_11/ICT\\_in\\_Serbia\\_At\\_a\\_Glance\\_2011.pdf](http://www.lokalnirazvoj.org/upload/Publication/Document/2011_11/ICT_in_Serbia_At_a_Glance_2011.pdf) (10.07.2014.)
13. Katić, A., Milošev, I., Raletić, S. (2013) ICT Sector in Vojvodina (Serbia) as a Potential for Mitigation of Crisis Effects. *The Second International Conference on Leadership, Technology and Innovation Management (2012)*, Vol 75: 298–307
14. Matijević, M., Šolaja, A. (2013) *ICT in Serbia - At a Glance*, ICT Network , Nis Cluster of Advanced Technologies – NiCAT, Vojvodina ICT Cluster – VOICT, [http://www.daad.rs/imperia/md/content/informationszentren/belgrad/23012013\\_ict\\_in\\_serbi\\_a\\_at\\_a\\_glance\\_2013.pdf](http://www.daad.rs/imperia/md/content/informationszentren/belgrad/23012013_ict_in_serbi_a_at_a_glance_2013.pdf) (09.07.2014.)
15. Mpn.gov.rs (2014) *Koja zanimanja su najtraženija u oglasima za posao*, <http://www.mpn.gov.rs/vesti/1415-koja-zanimanja-su-najtrazenija-u-oglasima-za-posao> (12.07.2014.)
16. Nbs.rs (a) (2014) *Set of Draft Laws on Financial Services Prepared by NBS*, <http://www.nbs.rs/internet/english/scripts/showContent.html?id=7335>

17. Nbs.rs (b) (2014) *PayPal Receive Option Does Not Require Amendments to the Law on Foreign Exchange Operations*, <http://www.nbs.rs/internet/english/scripts/showContent.html?id=7397> (12.07.2014.)
18. Ni-cat.org, *About Cluster*, [http://www.ni-cat.org/index.php?option=com\\_content&view=article&id=43&Itemid=77&lang=en](http://www.ni-cat.org/index.php?option=com_content&view=article&id=43&Itemid=77&lang=en) (10.07.2014.)
19. Ntpcacak.rs, *Stanari*, <http://www.ntpcacak.rs/index.php?page=stanari>
20. OECD Library (2013) *Households with access to home computers, Internet and telephone*, [http://www.oecd-ilibrary.org/economics/oecd-factbook-2013/households-with-access-to-home-computers-internet-and-telephone\\_factbook-2013-table171-en](http://www.oecd-ilibrary.org/economics/oecd-factbook-2013/households-with-access-to-home-computers-internet-and-telephone_factbook-2013-table171-en) (13.07.2014.)
21. SeeNews (2012) *Serbian IT Market – The New Old Star*, [http://research.seenews.com/wp-content/uploads/2012/11/IT\\_Market\\_in\\_Serbia.pdf](http://research.seenews.com/wp-content/uploads/2012/11/IT_Market_in_Serbia.pdf), (10.07.2014.)
22. SIEPA (2012) *Serbia ICT - Smart Solution*, [http://siepa.gov.rs/files/pdf2010/ICT\\_small.pdf](http://siepa.gov.rs/files/pdf2010/ICT_small.pdf) (11.07.2014.)
23. Statistical Office of the Republic of Serbia (a), <http://stat.gov.rs/> (12.07.2014.)
24. Statistical Office of the Republic of Serbia (b), <http://webzrs.stat.gov.rs/WebSite/Public/PageView.aspx?pKey=128> (12.07.2014.)
25. Statistical Office of the Republic of Serbia (c) (2013) *Upotreba informaciono-komunikacionih tehnologija u Republici Srbiji, 2013.*, <http://webzrs.stat.gov.rs/WebSite/repository/documents/00/01/14/04/PressICT2013.pdf> (12.07.2014.)
26. Swiss Statistics Web site, *Employment and Income*, <http://www.bfs.admin.ch/bfs/portal/en/index/themen/03/01/key/jobs.html> (12.07.2014)
27. UNCTAD (2012) *Information Economy Report 2012*, [http://unctad.org/en/PublicationsLibrary/ier2012\\_en.pdf](http://unctad.org/en/PublicationsLibrary/ier2012_en.pdf) (12.07.2014)
28. UNDP.org, *About Serbia*, <http://www.rs.undp.org/content/serbia/en/home/countryinfo/> (11.07.2014.)
29. Vaidyanathan, G. (2008) Technology parks in a developing country: the case of India. *The Journal of Technology Transfer* 33(3): 285-299
30. WEF (2013) *The Global Information Technology Report 2013*. [http://www3.weforum.org/docs/WEF\\_GITR\\_Report\\_2013.pdf](http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf) (10.07.2014)
31. WEF (2013) *The Global Information Technology Report 2014*. [http://www3.weforum.org/docs/WEF\\_GlobalInformationTechnology\\_Report\\_2014.pdf](http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf) (10.07.2014)

## POTENCIJALI I PERSPEKTIVE RAZVOJA IT SEKTORA U SRBIJI

**Rezime:** Cilj ovog rada jeste da ukaže na potencijale za razvoj IT sektora u Srbiji, neophodne reforme i moguće pravce budućeg razvoja. I pored činjenice da je IT sektor jedan od najbrže rastućih u Srbiji, njegovi potencijali nisu u potpunosti iskorišćeni. Budući da je reč o profitabilnom i propulzivnom sektoru koji može pozitivno uticati na privredni rast i razvoj ostalih sektora, njegov razvoj u budućnosti bi trebalo postaviti kao prioritet. Pre svega, potrebno je povećati iznos ulaganja u ovaj sektor i sprovesti različite podsticajne mere. Takođe, poželjno je podsticati formiranje što većeg broja IT razvojnih centara, klastera i ostalih oblika udruživanja. Konačno, važno je sprovesti niz regulatornih promena i drugih reformi kako bi se stvorili bolji uslovi za povećanje stepena konkurentnosti ovog sektora.

**Ključne reči:** IT sektor, reforme, razvoj, konkurentnost .