Project

SUPPORT TO THE EDUCATION AND INFORMATION CENTRE OF THE INTELLECTUAL PROPERTY OFFICE OF SERBIA

Theme

Review of the Innovation Process and the Corresponding Funding Possibilities in Serbia

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Introduction

Relevant country background

Despite of the fact that Serbian Government policies include objectives of fundamental economic reform and restructuring of industry, the country continues to experience major constraints on economic development. Enterprise restructuring has been delayed, foreign direct investment, at record levels in 2006, are now dramatically less, a huge trade deficit exists, unemployment remains high (approximately 21% with recent force surveys), mismatches exist between labour demand and supply and labour costs are too high to be considered as a competitive advantage. At present investments in new equipment, technologies and human resources, essential to Serbia’s medium to long-term economic well-being, are not being made on a meaningful scale.

At a same time, Serbia possesses a number of strategic competitive advantages including, knowledge of and access to regional and international markets; excellent agricultural conditions; a strategic location on major European land routes and a major waterway; relatively low labour costs, and a potential for tourism. Trade agreements with the European Union and (uniquely) with Russia, together with the creation of the South East Europe Free Trade Area, offer substantial opportunities.

In the period 2000-2010 Serbia changed five governments, and all of them aimed at developing a strong domestic private sector, using the Small and Medium Enterprises (SME) sector as the key to economic regeneration, as focused in different essential strategies adopted in the last period. All of them recognize the need to strengthen the private sector and make it internationally competitive through the development, inter alia, of management capacities, introduction of quality systems into business operations and fostering innovations and up-to-date technology.
It is crucial for the competitiveness of Serbian enterprises to improve. Individual companies of all sizes in the manufacturing and service industries still face formidable obstacles both within Serbia and in their potential export markets. Typical problems include: lack of capital and technology, lack of understanding of marketing, lack of expertise in management, low levels of product development and innovation, poor packaging, lack of product certification, an incomplete legislative environment, expensive working capital, lack and high cost of pre-export finance, lack of infrastructure, and low proficiency in Western European languages in many enterprises.

The business environment improved in relation to the one of a few years ago. The implementation of new laws in company registry, bankruptcy and other company legislation has advanced slowly in 2005 and the first half of 2006 and now it is easier than before.

The banking sector was faced with dramatic reform in recent years, from a position of virtually zero trust in banks at the start of transition. Credit growth is rising rapidly and international foreign banks are now the key players on the market. The imposition of high mandatory reserve requirements on the commercial banks is having an adverse effect on credit availability.

**Current state of affairs in the relevant sector**

Innovation is the renewal and enlargement of the range of products, services and the associated markets; the establishment of new methods of production, supply and distribution; the introduction of changes in management, work organization, and the working conditions and skills of the workforce.

An innovative enterprise seeks to raise its competitiveness through constant improvement of its products, processes and services and its organization, methods and structure. Innovation is a challenge for every business and every sector, particularly those exposed to international competition in the domestic and export markets.
For innovation, very often is used statement that it means connection of 4P:

<table>
<thead>
<tr>
<th>Product innovation</th>
<th>Changes in the products/services which an organization offers</th>
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<tr>
<td>Process innovation</td>
<td>Changes in the ways in which they are created and delivered</td>
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<tr>
<td>Position innovation</td>
<td>Changes in the context in which the products/services are introduced</td>
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<td>Paradigm innovation</td>
<td>Changes in the underlying mental models which frame what an organization does</td>
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In the recent years the Serbian economy experienced sustained growth in GDP. This growth is largely due to catching up based on domestic consumption along with a slow recovery of Serbian exports based essentially on cost-based competition. To maintain economic growth as wages costs rise, Serbian enterprises will need to increase investment in new technologies to promote productivity gains and develop new products and services. This requires access to financial resources but also internal management capacities, skilled personnel and links to organizations in Serbia and elsewhere, which can assist in the development, marketing and distribution of new products. Serbian economic development is currently investment-based and is aimed at modernizing and upgrading the industry, technological resources (equipment, machinery, software) and human skills. Its growth is still relying mainly on domestic demand, which is not sustainable in long-term, and needs to be more export-oriented and innovation-based. Serbia needs to move from the investment phase to the innovation driven phase, with the economy based on higher value added products which are globally competitive, with better and more qualified jobs in internationally competitive and high-growth sectors. According to Serbia Economic Memorandum, “given Serbia’s low savings rate and its need to reduce the current account deficit, near-term growth is unlikely to come from major increases in investment rates. As recorded employment rates are already high, near-term growth will also probably not be driven by further increases in employment (which is likely to fall before beginning to rebound). For these reasons, the immediate growth impulse will need to come from improved external competitiveness (through adjustments in macroeconomic policy) and enhanced productivity”. The levels of productivity are still low compared to those
of neighbouring countries. Croatia, Hungary and Slovenia all had higher total factor productivity levels than Serbia. Low level of labour productivity in Serbia is one of the most significant barriers to the country’s economic growth and competitiveness. One of World Investment Reports\(^3\) highlights the growing tendency towards internationalization of R&D functions by major transnational corporations (TNCs). International investors are not only looking for opportunities to reduce their production costs utilizing cheaper labour in less developed countries, but are increasingly investing in competitively priced, research intensive activities there. Serbia needs to be in the position to take advantage of this recent tendency and attract investment flows into research and knowledge-intensive sectors of economy.

Generally the economy of Serbia is at the stage when achievement of sustainable growth and international competitiveness is impossible without adopting a new, dynamic, export-oriented paradigm based on use of knowledge, innovation and technology, with higher productivity levels, more and better skilled jobs, and a vibrant Small and medium enterprises sector, (SMEs). There is a strong need to develop a balanced, competitive and dynamic national innovation system with the relevant institutional mechanisms to support its evolution.

The analysis of the National Innovation System in Serbia shows that there is a number of strengths and weaknesses. The effectiveness of any innovation system is measured not only by the strength of its elements (i.e. industrial system, educational and research institutions, innovation governance and policy, demand and framework conditions, innovation support infrastructure and intermediary organizations), but by the extent of co-ordination and efficiency of linkages among its key components.

The Serbian economy has historical concentrations of employment and production in a number of sectors including agri-business, automotive and component production, textiles and wood and furniture industry. Major export products include steel, tyres for motor vehicles, fruits (notably raspberries), plastics and medicines. Emerging and fast growing sectors include electronics with segments such as computers and office equipment growing rapidly. However, the share of total employment located in medium/high technology manufacturing and employment in high-tech services are both significantly below EU25 levels and even below the levels of neighbouring Bulgaria and Romania (except for the high-tech services in Romania where Serbia performs better)\(^4\).
Preliminary data from the innovation survey of Serbian enterprises suggest that overall Serbian firms consider themselves to be highly active in terms of innovation (above comparable figures for the EU25 average). However, rates of investment in innovation expenditure are very low and most of the innovation activity is concentrated in the acquisition of machinery and equipment and related training. This phase of dissemination of new and updated technologies within Serbian enterprises is crucial and has been witnessed in most other transition economies.

Yet, in order to move from this ‘investment phase’ in development terms from which a boost to labour productivity can be expected, to an innovation driven phase where the economy shifts to higher value added products creating greater wealth and securing longer-term competitiveness, enterprises will need to invest more in R&D, in partnership with academic and other not-for-profit research institutes. This requires not only raising and attracting new financial investments (including from foreign investors) but also the freeing up of resources (human and financial) currently blocked in non-profitable undertakings in favour of enterprises able to generate growth in sales of new products, notably in export markets. Another key indicator is the rate of patenting which is one indicator of the impact of R&D activity on specific sectors of the national economy but also of the diffusion of technologies and the potential for immitative innovation via non-resident patenting. On an absolute level, Serbia ranks very poorly on patenting activity which is no doubt in a part due to the downturn in R&D investment and the relative cost of patenting.

Historically, Serbia invested considerable resources in research and technological development but during the 1990s public and private investment levels in R&D and innovation fell sharply. Over the last few years, public investment in R&D has begun to pick up again and currently stands at 1.22 percent of Government budget.

However, this figure needs to be placed in context, firstly the absolute level of GDP remains low yet investment costs for R&D involve purchasing equipment, etc. at the world prices. Secondly, some studies have shown that the relative returns in terms of growth and productivity from public and private investments in R&D is markedly different, with the latter playing a more important role in boosting productivity and competitiveness.
Accordingly, the persistently extremely low rate of business expenditure on R&D (as a share of GDP) is a major cause for concern in terms of the short to medium term potential to create new innovative products and processes in Serbian enterprises.

In this report, the subjects of analysis, regarding innovations and their implementation in the Serbian economy, are:

- Strategy for scientific and technological development 2010.- 2015 \(^{(5)}\)
- Partnership for a national innovation system
- Seven national R&D priorities
- Current and draft legal framework
- National and international financial support to innovation in Serbia, and
- Main national and European web based sources of information on innovation

Faced with the fact that in this moment Serbia takes real bottom of the list of the countries that are according to their size similar to Serbia in respect of GDP, Figure 1, in the course of 2010 the Government of Serbia adopted Strategy of scientific and Technological Development of Serbia for the period 2010-2015 with the aim of significantly greater involvement of scientific potential into the whole country development.

![GDP of Serbia and countries with the same or less population](image)

*Netherlands has a 2 times less area then Serbia*

The main point of this strategy is VISION OF SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT OF SERBIA:

*Serbia as an innovative country where scientists reach European standards, contribute to the knowledge of the entire society and the technological development of the industry.*
At this moment Serbia does not play a significant role in any of the scientific disciplines in Europe or the world, and first sentence in this strategy is:

„Serbian science, despite improvements over the past few years, is still on an unsustainable path“.

Indisputable individual talents cannot make up for the fact that none of its universities have been listed on the Shanghai Top 500 List (7). None of Serbian institutes can be qualified as being one of the leading centers of excellence in the European Union. Globalization has led to a multiplication of technological and scientific centers. In addition to the traditional players: Western Europe, the United States of America, Japan, and Canada, the last twenty years have seen the recovery and reappearance of Russia, as well as India, China, Brazil, and even the Middle East. All of them have been making significant investments in science and technology.

Therefore, it is necessary, to identify the areas where a country of the size of Serbia and with the situation that Serbia is in, can become relevant on the global scale within a reasonable period of time.

It is possible by providing long-term funding, developing centers of excellence and improving living conditions for researchers. This is the way to proceed so that young scientists can have a sufficient reason to base their lives and their future career in Serbia, with a normal and desirable amount of mobility. At the same time, it is need establish a link between science and the industry, but that will require tax and budgetary incentives during the economic crisis. Defining a legal framework for co-financing technological development programmes through public-private partnerships based on an equitable distribution of income from intellectual property among stakeholders in the process of creation of such property is a complex, yet indispensable undertaking.

The government must stimulate local technology through programmes designed at different levels of governance including public enterprises, by giving a chance to local knowledge and
expertise. However, it is certainly much more difficult, yet necessary, to define requirements which are going to be used not only as a way of evading public procurements and pushing through solutions that make no contribution to the competitiveness of the whole country.

Vision that is Serbia as an innovative country where scientists have attained European standards, contributing to the overall level of knowledge of the society and promoting the technological development of the economy, based on two key words, “focus” and “partner”.

Focus, because Serbia must define a list of its national science priorities where it can make the most progress.

Partner, because scientific development is a matter of the entire society as well as being an issue where Serbian science must find research and business allies, in the country and abroad.

How to identify Serbian priorities in science and technology? This is the key issue of the whole Strategy.

The following criteria have been applied:

- being in line with other national strategies
- possibility of successful participation in the Lisbon agenda and alignment with EU research priorities
- number and quality of current human resources, in country and abroad
- investments so far over the past seven years
- success of researchers up to now
- amount of future investments needed to have critical mass and be relevant
- applicability in industry, in Serbia and abroad
- current international collaboration and potential for improvement
- multidisciplinarity
- importance for national agenda and affirmation of national identity
Current Situation

In March 2000 at that time 15 EU leaders agreed at the Lisbon Spring Council\(^{(8)}\) that the EU should commit to raising the rate of growth and employment to underpin social cohesion and environmental sustainability. The US economy, building on the emergence of the so-called ‘new’ knowledge economy and its leadership in information and communication technologies (ICTs), had begun to outperform all but the very best of the individual European economies. Europe, if it wished to protect its particular social model and continue to offer its citizens opportunity, jobs and quality of life, had to act with determination — particularly in the context of the mounting economic challenge from Asia and the slowdown of European population growth. The EU set itself ‘a strategic goal for the next decade: to become the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment’. The Council of Europe voiced their appeal for the old continent to increase its allocations for research and development from 1.9 to 3% of the GDP. Two years later, an action plan was adopted in Barcelona referring to increasing the level of investments in research and development. As a consequence of that budget for R&D of a many country, rapidly increase, Figure 2.

Figure 2. The budget for R&D of a some Europe country\(^{(9)}\)
During last seven-years period in Serbia, the salaries of researchers grew multifold, and almost 30 million Euros were invested in capital equipment for scientific research work. Still, the share of science in GDP in 2003 amounted to 0.3% continuing to stagnate at that level right until now, Figure 3.

In the same period of time, having emerged from the difficult period of the nineties, relatively Serbian budget allocations for science marked a significant growth in the gross amount, from the modest sum of approximately US $ 40 million in 2001, to about US $ 140 million in 2008, Figure 4.

In addition to the budget funds of the Ministry of Science and Technological Development (MSTD), there are also other sources of investment in science in Serbia. Other ministries and public administration authorities also provide for modest budgetary allocations for science and technology, including the Autonomous Province of Vojvodina. Institutes generate income through cooperation with the industrial sector and take part in international programmes, the estimates being that the income of the institutes in 2008, apart from the MSTD budget,
Figure 4 The Serbian budget allocations for science

amounted to about 12.5 billion dinars. At the same time, higher education received 23 billion dinars from budget financing in 2008, having also generated approx. 12 billion dinars of own income, making a total of 1.3% of the GDP.

Nevertheless, compared to developed countries in the world, Serbia is severely lagging behind. The fact giving rise to concern is that in this respect Serbia is significantly lagging behind in relation to the countries in its neighborhood, all of which, except for Albania, have allocations in excess of 0.5% of GDP, while Slovenia and Croatia allocate more than 1% of GDP.

Apart from the low allocations for science, another disquieting fact is the absence of a clear and positive trend in the allocations. In all highly- and medium-developed countries in the world, investments in science have been growing on a steady basis, and the trend has not been interrupted even by the effects of the global economic crisis, Figure 5.
Figure 5 Budget for R&D in the some of Europe country

(11)

Quite the contrary, in certain parts of the world, allocations for science have marked spiraling growth: the USA has announced doubling its budgetary allocation in the next ten years, while China has been increasing its science budget every year by almost 20%. If it is making comparison between budget allocation per capita, a Sebian position is extremly poor, Figure 6.

One of the key objectives of the Lisbon Agenda is to ensure that of the 3% of the GDP, which is the targeted amount of allocations for science, only one third comes from the budget of the European countries and the EU, while as much as two thirds should be covered by investments in research activities, made by the private sector. Although not all European countries are close to accomplishing this goal, the European average for 2007 shows that in the case of EU-27, only 35.4% of the allocations for science originated directly from the budget, 54% from the economy and 10.6% from other national and international sources. (11) Some countries, such as the USA, Sweden, Germany, Switzerland, and China have already reached the level where investments in science made by their economy account for tow thirds
of the overall investments. In Japan, the share of the private sector has reached a record 76.1%.

Figure 6 GDP per capita for R&D (11)

Even the countries in our region have had significant investments in science from the private sector: in the Czech Republic as much as 54% of allocations for science come from the industry, in Estonia 38.5%) in Hungary 39.4%, and in Romania 37.2%. Another consequence of this trend is the fact that scientific research activities do not take place only at universities and state science institutes; the relevant developments have made it possible to employ a large number of scientists in the private sector where some of the most advanced global research activities have been taking place.

One of the consequences of the nineties in Serbia is the fact that the military, once a leading financier in the area of applied scientific research activities in Serbia, no longer has the funds for supporting development projects. Also, the development centers of our formerly major companies have been dissolved over time after the companies lost their markets during that
grievous period of time, and the privatization of the companies frequently resulted in either reducing the size and potential of these centers or their dissolution.

One of the major problems Serbian science is faced with is that the small amount of resources invested in scientific research mainly from one source, were distributed among more than 1,000 projects. In 2009, the MSTD is financing 501 projects in the area of basic research for which the amount allocated equals 50.2% of the total budget, Figure 7.

![Figure 7 Distribution of the science budget by departments (in percentage of the total R&D budget in 2009)](image)

Apart from these projects, the Ministry also finances 471 projects in the area of technological development for which the sum allocated amounts to 39.2% of the budget of the Ministry. As opposed to Serbia, this proportion is the opposite in the majority of European countries and most developed countries in the world, while allocations for applied research activities represent the major part of the state budget. Also, practically 80% of the funds intended for science projects are actually salaries for researchers, and a disproportionately small part of
those funds goes for the costs of experiments and the like. Although equipment worth 27 million Euros has been procured thanks to NIP funds, following a period of twenty years of no investments in equipment, it often happens that the lack of resources for everyday functioning leads to a situation where that equipment is not used to its full capacity, or is not used at all in some cases.

The productivity of science can be measured by different indicators, and the impact it produces on the industry and the economy is of great importance, but that is an aspect which is at a rather low level in Serbia without manifesting a remarkable growth tendency. The state of affairs in science in 2000 was at a very low level and required a radical reform. For instance, in the period from 2000-2003, Serbia published 607 papers per million inhabitants on average, while Sweden published 14.5 times more in the same period, i.e. 8,845 science papers. In order to improve the given situation, the Ministry of Science took steps to implement different incentives which contributed to a significant increase in the number of the published scientific papers. One of such measures were awards for 20% of the best scientists in Serbia according to internationally recognized criteria (number of papers and quality measured in terms of the impact factor, citations made). After that, during 2005, criteria were established regarding the evaluation of projects and researchers for the new 2006–2010 project cycle, based on which researcher categories where formed in the basic research areas, differing in terms of funding. On that occasion, some 500 researchers lost financing, however, the best researchers were granted larger incomes.

The number of papers published in Serbia in the period from 2000 to 2004 marked a low increase, however in 2004, and especially in the period from 2005 to 2007, there was a large increase in the number of publications. Thus, the figure of 927 scientific papers published in 2000, grew to 2,047 in 2007, with the upward trend continuing in 2008 when the number of published scientific papers was 2,558, Figure 8.

In contrast to the period from 2000-2003, when Serbia was at the bottom of the list in Europe according to the number papers on the SCI list and according to the number of citations, also lagging behind severely in relation to the countries in the immediate neighborhood, in the recent period - 2006, 2007, and 2008, it managed to surpass certain countries in the region in terms of the number of papers (Bulgaria, Croatia) and it even managed to catch up with
Slovenia. Of course, in terms of the number of inhabitants Serbia is still significantly behind them.

Figure 8. Total number of scientific papers in Serbia compared to countries in the region \(^{(13)}\)

It is interesting to note that if the number of papers published in Serbia is brought into correlation with the amount of funds invested in research and development, Serbia is among the leading countries in the world. Compared to the countries in the region, the amount of funds invested per one paper published in Serbia is about one third of the amount invested in Croatia, and about 4.5 less than in Slovenia, Figure 9.

However, that indicator has not been used as a measure of a nation’s success, specially because if it is a measure of impact of published paper to GDP, Serbian science has five times less influence to national GDP growth than, for example, Slovenian, Figure 10.
Figure 9 Funds expended per one paper published (13)

Figure 10 GDP of country per capita and one paper published (13)
Serbian R&D budget of roughly 100 million Euros is distributed over all the scientific disciplines, there is not any of the basic research areas that receive an annual budget allocation of more than 10 million Euros. The largest funds are allocated for chemistry (7.7 million Euros) followed by social sciences (7.1), biology (6.9) and physics (5.4), Figure 11.

In the field of technological development, apart from bioengineering and agroindustry which are allocated to 14.2 million Euros annually, none of the other fields are allocated more than 5 million Euros, Figure 12. The total science budget of Serbia in 2008 was about 100 million Euros (of this amount, our major Institute Vinca receives an allocation of approximately 12 million Euros) which is not comparable even with certain renowned universities or institutes at the global level, that have annual budgets above one billion Euros as a rule.

Figure 11 Financing of basic research in 2008 according to scientific fields (14)
In Serbia, intellectual property is either not being created or not being protected. In accordance with the basic definition and purpose of technological development projects, they are to result in the implementation of technical solutions, patents, pilot facilities, new innovation types, technological upgrading and solutions that can be directly applied. The past period (2003-2007) saw the implementation of over 3,400 technical solutions in the field of technical development.

Despite such a high number of technical solutions, the number of patents registered by scientific-research organizations in the period from 2003-2008 was just 21, including 36 patent applications, Figure 13. The relevant figures in the corporate sector were not remarkably better, with about 20 patents registered per year, while individual inventers registered more than 300 patents in the same period. In view of such results, Serbia is at the very bottom of the list in Europe.
Focus of Strategy

Strategy means implementing interrelated measures for accomplishing a defined objective based on decisions on allocating limited human and financial resources. It is indisputable that larger investments should be made in science. The crucial issue is when, with what objective and based on what success is measured. Leading nations in the world invest dozens of billions of Euros a year in science and technology, either through national budgets or companies. The required investments for the most advanced experiments have induced leaders to cooperate through the "CERN" or "ITER" projects. Europe is clearly heading for the rationalization of its science infrastructure.

The major science nations in the world have identified their priority shortlists because of the necessary investments and in order to provide for critical mass and relevance, Table 1.

Figure 13 Structure of patent applications by domestic applicants (15)
### Table 1. R&D international priority

<table>
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<tr>
<th>Country</th>
<th>International Priorities</th>
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<tbody>
<tr>
<td>Great Britain</td>
<td>Energy, e-sciences, Genomics/Proteomics, Stem Cells, Neurosciences, Rural Economy and Land Exploitation</td>
</tr>
<tr>
<td>France</td>
<td>&quot;Life Sciences&quot;, Biotechnology and Health, Energy, Security, Socio-Economic Sciences and Humanities, Environment, Earth and Space Studies</td>
</tr>
<tr>
<td>USA</td>
<td>Advance Defense Systems, Health Protection, Agriculture, Energy, Space Exploration and Exploitation, Basic Research</td>
</tr>
<tr>
<td>EU</td>
<td>Health, Food, Agriculture, Fisheries, and Biotechnology, Information and Communication Technologies, Nanosciences, Nanotechnologies, Materials and New Production Technologies, Energy, Environment (including Climatic Changes), Transport (including Aeronautics), Socio-Economic Sciences and Humanities, Space, Security</td>
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Serbia, with hardly one hundred million Euros a year in the form of state investments in science, and with practically none from the corporate sector, has many more reasons to focus on its own endeavors. This annual budget is approximately ten times less than the budget of any of the fairly renowned universities or institutes in the world, and focusing to priority is most important.

This is the key issue of the whole Strategy:

“How Serbia can identify its priorities in science and technology?”

The relative success achieved so far and the existence of qualified staff is a good recommendation for further investments. However, it must be crossbreed the reality with European and global trends in order to be able to prepare the nation for future challenges and potentials rather than for the present or past ones.

To establish national science and R&D priority, the following criteria were applied:

- being in line with other national strategies
- possibility of successful participation in the Lisbon agenda and alignment with EU research priorities
- number and quality of current human resources, in country and abroad
- investments so far over the past seven years
- success of researchers until now
- amount of future investments needed to have critical mass and be relevant
- applicability in industry, in Serbia and abroad
- current international collaboration and potential for improvement
- multidisciplinary
- importance for national agenda and affirmation of national identity
Nine basic sciences have been analyzed including thirty five sub-areas, as well as nine technological research domains with forty six sub-areas (elements posted on the site: www.nauka.gov.rs).

Leading researchers, businessmen and state institutions in the relevant domains participated in a debate about these criteria. Consultations were also organized with the National Council for Science and Technological Development and the Serbian Academy of Sciences and Arts.

The analysis of scientific fields in Serbia resulted in the identification of seven national priorities in the domain of science and technology:

I. biomedicine and human health
II. new materials and nanosciences
III. environment protection and countering climate change
IV. agriculture and food
V. energy and energy efficiency
VI. information and communication technologies
VII. improvement of decision making processes and affirmation of national identity

The next activities are planned for the implementation of the Strategy through partnership and system improvement:

- identification, development and support for talented young researchers
- clearly and quantitatively determine a midterm plan for enrollment of higher education and science
- project evaluation and career development that match national priorities
- flexible system of financing according to the national priorities
- improving the position and results of social science and humanities
- through partnership towards a national innovation system
- partnership within the system through rationalization of the R&D network and close cooperation between institutes and faculties
- integrating RDIs and faculties into one science-educational system
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- partnership with society through science promotion
- partnership with industry through a law intellectual property and through incentives
- partnership with scientific Diaspora through joint projects
- partnership with international organizations through programs and developing databases and relevant statistical methodology
- partnership with industry through an Innovation development fund
- partnership with international scientific community
- partnership with other ministries through participation of scientific community in major infrastructural and other projects in Serbia

Financial Instruments of Strategy

The main precondition for the success of this strategy is Increasing and diversifying R&D expenditure, as well as investing 300 million Euros in infrastructure!

The main goal is to reach 1% of GDP for science by 2014, not counting infrastructure investments, with the next Serbian R&D infrastructure investment initiative:

- Upgrading existing capacities (~70 million Euros)
- Development of human capital (~33 million Euros)
- Development of Excellence center and academic research centers (~60 million Euros)
- Development of information and communication technology infrastructure (30 to 80 million Euros)
- Creation of a knowledge-based economy through the construction of science parks in Belgrade, Novi Sad, Nis and Kragujevac (~ 30 million Euros)
- Basic infrastructure projects (~ 80 million Euros)
**The Implementation of Strategy**

The implementation should be monitored by the Ministry for science and technology development with the Ministry of Finance, Ministry of Education, Ministry of Economy and other Ministries, the National Council of Science and Technology, National Council of Higher Education, Serbian Academy of Sciences and Arts, other advisory bodies and representatives of local and international companies.

Implementation instruments will be preserved through the following programs call for definition and planning:

*Integrated R&D programs*, which favor targeted unification in the long-run of the fundamental and developmental research and are targeted at redressing topical and long-term development problems in Serbia in line with its development priorities. Conditions should be created for high quality fundamental research directed towards knowledge needed in fundamental research, whose results should be applied to the greatest extent towards developing original and innovative technological solutions and products. The integrated R&D programs are financed and implemented under a special term sheets. The most part of the fundamental and applied research should be financed within Integrated R&D programs.

*Public invitations for project* application within fundamental and applied research should be annually published, largely within the Integrated R&D programs. The applied projects should go through a clear and transparent scoring procedures, with the application of usual international criteria and engagement of independent reviewers from the country and abroad. The National Council should establish at the proposal of the Ministry the rate of fundamental to applied research, and integrated R&D programs in the chapter of the budget appropriations to science research, provided the already taken obligations should be respected.

*Program of technological development* should enable development of new technologies, development of all the products and enhancement manufacturing and business relations. A precondition is strict selection of technical projects to be financed in compliance with strategic priorities.
Program of incentives for development of innovations, to be made possible by financing of innovative projects within NIO and industry, establishment, development and activity of innovation centers, assistance in commercialization of products and intellectual property rights.

Program of knowledge transfer, which should make possible the development and operation of centers for transfer of know-how and networking, organization of training courses for new technologies, incentives for feasibility studies of introduction in Serbian industry (in cooperation with the Fund for research and technology, banks and the Fund for development).

Program of establishment of risk capital funds, which should spur up the establishment of private funds of risk capital: Fund for innovation development.

In addition to the program, new legislation will be necessary, or changes and amendments to the existing one, which regulate science research and innovation activities, higher education, establishment and operations of enterprises, taxation system, Budget law, etc.

The Government should approve a separate Action Plan to define implementation schedule of such products and identify their proponents using a next success criteria:

- Target defined and applicable science research programs
- Application of research results
- Enhancement of higher education
- Improved efficiency of allocation and use of all science research and development resources
- More efficient distribution of funds to science
- Enhancement of applied technology as a result of own development
- Development of national innovation system ensuring international competitiveness of Serbia
- Development of small and medium enterprises based on innovations

In this moment there is not any action plan of strategy implementation, and predicted results can be measured during the next years.
Based on the said in the Strategy as well as and priorities that are emphasized in the Strategy, it may be concluded that in this moment Serbian science is to the greatest extent directed towards publishing of scientific papers and not towards implementation of scientific results in the economy.

On one side this is instigated by the Government itself, almost exclusively appreciating the number of published papers on SCI list and not evaluating, at least to the equal extent, improvements, innovations and patents. With such an imperative, science becomes more and more closed and represents a segment of the society that is self-sufficient, without real connection with very bad reality in Serbian economy and society.

An excuse for this is in an apology that there are not concrete requirements in economy, but this is also covered by the fact that scientists don’t even look for contact with economy because they are simply not asked by the state to do so, reducing total financing of R&D to social and not developing category.

This issue may have long-term consequences for the Serbian society but in this moment it is even consciously neglected by those who are responsible for conducting of scientific and also entire politics.

The change of awareness of necessity of investments in R&D as well as everyday presence of researchers and their results in economy units, local community, education as well as media is a priority that would have to be required for implementing in the shortest possible time in Serbian society, so that faster development could be expected.

If the researchers and their scientific results would be exposed to positive or negative critic of public that allocates funds from budget for their work, there would be space for much better communication and understanding of required increase of investment in R&D and implementation of their results. That is the only and worldwide known way for increase of competitiveness and towards production of the export oriented products, as a precondition for increase of total GDP and step from lowest positions by which successfulness of a country is measured, which Serbia in this moment withholds.
It’s not a rare case that in Serbia even researchers from neighbouring laboratories are not familiar with creations of their colleagues with whom they work in the same organization. Based on the conduct of the up-to-date practice and making quasi-elitism in science, results of scientific – research work in Serbia are difficult to access for those that pay tax and pay with their money for R&D, so as to their influence on the priorities of R&D is almost neglectable. The presentation of scientific results to the entire society in Serbia, that could implement these results in its practice and not only to those individuals that have access to international journals and data bases worldwide, which should become a good practice.

The Strategy does not consider this in a satisfactory way and does not give direction of how to surpass it concretely.

Taking it all into account, the Strategy is, like many other strategies up-to-date, brought and adopted in Serbia and it gave review of the present state, but didn’t show enough or provided for real mechanisms of their implementation.

In all Strategies that the Author of this Report had a chance to read or to participate in their preparations himself, it as usual lacks a small segment i.e. an opinion of the Ministry of Finance and its view of the fulfillment of the Strategy.

Without this element no Strategy anywhere in the world, and especially in Serbia can be implemented successfully i.e. devotion to the increased investment in R&D will remain only declarative wish and not reality.

This is important not only for financing the sector of R&D but also for the change of awareness of its importance for the future of entire Serbian society, that first of all has to be insisted on by the Government of Serbia.

In order to understand this in a right way, the datum that in the last 20 years there were 104 Presidents and Ministers in the Government of Serbia, 21 out of which were engineers. However just a neglectable number of them also led the sector within his expert field, and the practice was much more present that the sector they administered had nothing in common.
with their education, so that the engineers of technology led the sector of civil engineering, and Civil Engineers dealt with telecommunications, while Electric Engineers led the sector of religions and etc. During that period, the Prime Minister having engineering education was ahead of the Government during period of only two years and during the nineties when that position meant an absolute dependence from decisions of President of the State at that time.

As an illustration of the change of awareness, “Chinese Prime Ministers of the third generation” i.e. Prime Ministers that led China in the last 20 years were exclusively having engineering education which led to a significant change of awareness in China about future of their economy, increase of investment in R&D and making of conditions for China to become the most powerful country in the world\(^{(16)}\).

Actually, learning from this example, the Strategy should have secured conditions for realistic change of awareness of necessity of R&D that is of greater quality and that is possible to implement in the Serbian society, however, it did not define necessary quantitative instruments for follow-up of fulfillment of the determined aims.
2. Partnership for the national innovation system

Establishment of the global common market requires the intensive development of a national innovation system, for any region or a country, as a necessary presumption of being competitive to the others. To achieve that, it is imperative not only for industry but to other segments of the society to maintain an atmosphere of permanent development and improvement, namely, as an ultimate aim, to create an innovative environment.

This could be achieved only by highly organized infrastructure which provides conditions for the development of a society of globally competitive educational, scientific and research organizations, producing world acknowledged results, which could be applied in practice. It is also essential to provide conditions for efficient introduction of innovative results in industry, so that the period from the competition of innovative procedure to commercialization was shortened to that at the world market. This requires partnership of all participants in the innovation system.

Innovation, together with scientific research, are the most important driving forces in the technological development of a country. The examples of highly developed countries, as well as those in the transition, show that only by innovative redevelopment, it is possible to remain concurrent in the world technological race.

Declaratively, the concept of the development of the innovative system, exists in all documents of the Serbian Government, relating to the scientific and technological development for the period up to 2015.

However, there is still an unbridgeable gap in Serbia, between science, research and development, and industry. That is a consequence of the transition period and the unclear vision of the future aims still present in Serbia, which is slowing down development effort, to the level that it effects the competitiveness with the others.

A national innovation system represents a complex network of companies, universities, R&D institutes, professional societies, financial institutions, educational and information
infrastructure, state agencies and public resources, for the generation, dissemination and application of scientific and technological knowledge in the country, Figure 2.1

The development of a national innovation system is an absolute necessity if Serbia is to be able to establish a knowledge-based economy and society.

\[\text{Figure 2.1 Structure of one innovation system}^{(17)}\]

**Educational system**

Education is the key instrument in the establishment of the system where innovations are the driving force for economy and the society. Innovative thinking is being formed at the early stages of psycho-physical and intellectual development, that means during attending primary and secondary schools. Certainly, there are ‘born inventors’ but they are so rare that there are small chances of building a dynamic economy based on innovations on talent only. Strategic planning of development is not possible hoping that a ‘natural genius’ will appear,
but each country should rely for its development on a large number of young workers and specialists, educated for creative and innovative thinking. To achieve this, the educational system have to be adapted to induce school children to original and innovative thinking, namely:

- to introduce the young to innovative thinking;
- support creativity and innovative ideas;
- instruct the young how to turn creative ideas into innovative projects which could be recognized, accepted and applied.

The education system as a whole, includes all forms of formal education, starting with kindergartens, primary and secondary schools (general and specialized), High schools and Universities, as well as all forms of permanent education, specializations and professional training.

As an ultimate result of the introduction of innovatively minded educational system the following social archetypes could be recognized:

- Citizens of all professions, of solid education, which accept the innovations in all segments of society as a normal way of life.
- Creative professionals in particular branches
- Visionaries which could recognize future trends and strategic aims
- Professionals in the innovative areas
- All individuals ready to accept the novelties without pressure from milieu or schools

The important outcome of a succesiveive educational system, expected to support the innovative thinking, its ability for self reproduction, that is, the acceptance of constant advancements in science, technology, economy, and generally in all segments of society. The educational program should stimulate the new generations to accept innovations and create innovative thinking.

Specialized education (technical schools), university technical faculties and high schools, professional technical education of adults, economy oriented schools) should produce
graduates able to understand and accept new technologies and economic structures, based on private enterprise and market economy, not only locally or nationally but in a much wider sense. They should also be aware the need for environmental protection, strict standards and regulations, maintenance and product quality control and also very severe competition.

As a difference to the present state in this domain in Serbia, an improved educational system could produce improvement in the number of new solutions and patents in all sectors and at all levels, as well as the number of original products, processes and technologies, and generally increase the competitiveness of Serbia as a state.

The key solution for the improvement of the existing education system in Serbia towards the support of innovations is the change in the teaching method, rather than the changes in the content of the teaching programs. Education oriented towards innovations, also should accept self-innovation. This could be achieved by new methods based on developing ability for thinking, creativity, the skill for problem solving, planning etc.

Existing educational system in primary and secondary schools in Serbia

Educational system in Serbia is based on the ‘old German model’ dating from the beginning of the XX century, with a certain influence of the ‘late Soviet model’ from the early nineteen-fifties. This means that it consists of eight years of compulsory primary school, followed by 3-4 years of secondary schools (general or professional), and 3,4 or more years of High Schools or University.

The schools are relatively large, (400 or more pupils), each grade is usually divided into classes of about 30 pupils, which amounts to 17-20 pupils per teacher. Primary education attend about 90% of children, the secondary more than 75%. Teaching programs are strictly defined by state and uniform for all primary schools. The teaching efficiency is varied and relatively low, because a standardized quality control system is not established as yet. There are large differences in the output values, accepted knowledge, skills, social values, between the various schools, depending on geographical position, rural or town environment etc. \(^{(18)}\)
Teaching methods and techniques are dominantly based on the reproduction of memorized data and definitions. The grading system is completely in the hands of individual teachers, and is not subject to control. Almost all primary schools, 94% of secondary and 60% of high schools are state owned and under direct control of the Ministry of Education. There is a small, but rapidly increasing number of private schools, profited oriented, with fees unacceptable for an average middle class family.

The school network is relatively well developed, but at the prize of a large number of miniature village schools (about 300 schools in Serbia have less than 20 pupils) and several hundred schools where teaching is done with combined grades.

Taking generally, the schools are in technically bad condition. The buildings are old, over 50 years, without modern technical equipment, libraries or informative technology equipment.

Basic advantages of the existing school system:
- Satisfactory developed horizontal and vertical school network
- Majority of teachers is well educated and experienced
- Population understands the important of school attendance
- Favorable geographical position of Serbia
- Certain forms of talented pupils support

Deficiencies of the existing school system:
- Excessive centralization and rigidity in decisions
- Out of date teaching methods
- Bad condition of school buildings
- Meager, centralized and bureaucratic school budget without promotive stimulation
- Suppression of the influence of the local community and parents
- Lack of the communication with economy
- Insufficient communication with non-government sector
- Topography of the school system and school network does not stimulate competition
- Absence of programs for permanent education of teachers
- Innovative teachers are insufficiently supported and protected
The school system in Serbia is faced with many possibilities but also with risks. One basic possibility for progress is that by permanent economic and social reformation of the society, the importance of better schools and education oriented towards creativity will be recognized by those responsible for economy, industry, finance and marketing, and that they will support the improvement in a system which would produce young, creative and ambitious people who will improve the productivity in all sectors of economy, industry and in society as a whole.

Cooperation with neighboring countries, exchange of experiences, experts and teachers, could be easy because of the absence of language barriers. The support of the EU countries is to be expected, not only through already existing programs, but also through exchange of experiences both positive and negative, particularly from the members who recently had undergone the transition period. The constantly increased use of the internet provides cheap and efficient communication between pupils, teachers and far away schools, and for establishing cooperation. After negative results of the investigations of efficiency and functioning of the school system, by an internationally standardized method, and also because of disagreements on the local scene about the reforms of the same, general public and particularly parents, became supporters of establishing the permanent control of the quality of work in education. Also in the domain of economy in general, and particularly in industrial production, there is an increased awareness of the importance of quality of products aimed for export to highly demanding markets. Consequently, there is an increasing demand for better education of experts who could fulfill such requirements.

The most dangerous risk facing the school system in Serbia is the large influence of political parties, who most frequently do not have clear visions, aims and solutions for many problems in that domain in their publicly declared programs. Furthermore they do not have enough qualified people among their members to undertake the difficult task of development, modernization and reconstruction of the system as a whole. In the last 15 years, there were 15 Ministers of Education, and even in one year three different people held that position! Evidently, the parties gave to their best qualified and able members seemingly more important and lucrative positions (economy, finance, police, foreign affairs, investment). Changes in political priorities and fluctuations in ideology, occurring in the last twenty years in Serbia, were bigger, with elements of violence, both from inside and outside, than in other European countries undergoing transition.
The private schools (primary, secondary and high) are also certain risk for the state education system. These schools are profit oriented, aimed to the children of rich parents, who want to separate their children from so called 'risky groups' in state schools, and also expecting high educational criteria similar to that in best private schools abroad. These schools also attract the best and most experienced teachers, because of high salaries. However, their programs are superficial and are generally less rigorous than in the state schools.

The risk for the country in general, and consequently the economy and education, is the 'Brain drain', as a large number of young highly educated people in the strategically most important areas, leave the country attracted by better salaries and working conditions abroad. The fundamental reason is however, that in the present stage of industrial development, the importance of foreign investment is overestimated, and that type of development requires cheap work power, not that which is well educated and with creative potential. Another 'drain' rarely mentioned in public is the 'inside drain'. Because of small salaries, a number of good and creative teachers leave state schools and seek another jobs. Transfer to private schools is not such a great loss, but the change of profession leaves the state schools with noncreative personnel. The consequences of this are not immediately visible, but will be difficult to correct in the future.

On the basis of the presented overall analysis it is evident that a fundamental reconstruction in the educational system in Serbia is inevitable. The main problem is to transfer priorities from the formal indicators (the percent of individuals with obtained formal qualifications) to the functional indicators (number of individuals with obtained usable qualifications and abilities). This should be done earlier or later, but the progress in the country could be expected only if the education is based on innovations. It is possible that it could happen under the pressure of public opinion, but more likely on the pressure of industry, even by organizing a parallel school system for educating graduates which will fit their requirements.

It rests on the state and political administrations to recognize the importance of 'innovative education' and to commence the implementation of school reforms.
Academic Education

Higher education in the Republic of Serbia has a very long tradition. In this moment there exist 7 accredited state universities (83 faculties), 8 private universities (46 faculties) and 6 Higher schools comprising 2 or 3 years academic level studies. The number of students enrolled (238,710) in the last ten years has almost doubled, as well as the number of graduates (29,406). However, the ratio of enrolled to graduated students is highly unfavorable and of immediate concern. (19)

The enrollment policy so far resulted in an inadequate number of enrolled (and consequently graduated) students in professional and scientific areas relative to the needs of existing science and technology development. Thus for instance, the proportion of graduated students at the University of Belgrade in 2006/2007 was: social/humanities 45.5%, technical/technological 31.5%, medical 16.9% and natural/mathematics sciences 6.0%. The ratio of graduated students by scientific areas is similar in other universities. Evidently, the less students enroll the faculties of natural and technical sciences compared to the faculties of social sciences. Such an orientation causes the lack of qualified staff for industry and teaching of fundamental and technical sciences. It also reflects in an unfavorable ratio of the number of scientific publications in fundamental and technical sciences compared to the social/humanity sciences. The same applies to the ratio of the output of the teaching staff for primary and secondary schools. Therefore it is necessary to implement a planning policy of enrollment of students to the faculties adjusted to the priorities of the nation.

Therefore, plan for the years to come is to define, together with the competent ministries, the number of enrolled budgeted students by individual areas in line with the determined strategic priorities. In addition, indirect incentives will be introduced for the studies of natural and technical sciences of importance for scientific technological development. Hence it is necessary to change the system of financing of the higher education (financing per capita), and to earmark the scholarship funds to the students of priority scientific areas. The required ratios of enrolled budgeted students are about the following: 15%- life sciences, 35%-technical, 15%-medical and 35%-social-humanities. With the view to the expediency of studies so far, it may be expected that the number of graduates will be at the level of 20% of
the enrolled, which in Serbia would come to one fifth of 250,000 namely 50,000 graduated a year.

The achievement of the stated measures is a precondition for very important policy of doctoral studies. The total number of students who completed post graduate studies and obtained master diplomas or doctoral is around 2,000 in the last couple of years. To reach the needed number of scientists per 1000 inhabitants this number should be doubled. Science, research and development capacities of a country depend largely on the number of the best graduated students. That is why in each area it is necessary to have sufficient number of them interested and motivated for further science and research work. The quantity of applied measures should produce the needed quantity in each area, which would turn into quality though the doctoral studies. The additional incentives should be to create more favorable conditions for science research work through: innovation of infrastructure (equipment, space, etc.), continued financing of fast availability of science research information, facilitated financing of proficiency studies abroad, improved living conditions of young researchers (personal income, material costs of research, residential problems and the similar). Based on the anticipated number of students at the accredited study programs and available capacities at the faculties (mentors, equipment, etc.) it was estimated that the budget will finance 5% of graduates to take up doctoral studies within a generation in each area (at the level of about 2,500 students) that will be adjusted to the determined priorities for development of science and the total economic and social development. Due to the significance of doctoral studies MSTD, shall together with the Ministry of Education, adopt a document on funding the doctoral studies that would regulate more in detail this very important area for future scientific potential.

**Research and development institutes**

R&D is only one source of innovation, but it is an important one. It takes various forms: basic research, applied research and product and process development. While basic research is mainly undertaken by the public sector, the other two forms are central to the competitiveness of many firms.
Like the rest of Serbian institutions, R&D system is still centralized and not efficient enough, with several important problems yet to be solved. Anyhow, comparing to other sectors, probably the best situation in the respect to European standards one can find in science and R&D sector due to reforms made by acting of the previous ministry in charge. The key players are the acting Ministries in charge for science and higher education. The financing of R&D project should be based on a transparent and fair system of evaluation and monitoring. One can say that the system is well established, but it needs much improvement to become more efficient, especially in respect to solving the key problems: lack of financing, insufficient communication and lack of application of RTD results. The main organizations in the Serbian ‘RTD supply sub-system’ are:

- Universities – Higher Education Organizations (HEO);
- Research and Development or so-called independent Institutes (RDI);
- Research and Development units (RDU) in industry;
- S&T Infrastructure.

The necessary vertical and horizontal coordination among the RTD bodies on national level, including universities, is provided by the Ministry of Science. Anyhow, lack of horizontal coordination within the Government is obvious.

According to the official data in the Ministry of science and technological development (20) of the Republic of Serbia, there are cca 200 scientific research and development organizations, of which cca 75 are in RDI, 35 in RDU and 90 are faculties of HEO. About 2/3 are active in basic sciences, and 1/3 in applied ones.

The RDIs have gone through a significant restructuring in the last few years. Among the RDIs, there are now proven partners in various businesses and industry. Most of the RDI suffered during the 1990s from lack of funding although some were able to become providers of technology solutions to enterprises faced by difficulties in sourcing from outside of Serbia.

In general, this has resulted in poor laboratory and office equipment, low salaries, lack of professional literature, difficulties in commercialization or follow-up of scientific achievements.
Some of the institutes are now successful companies that produce equipment for the telecoms industry, hospitals and medical laboratories etc. They manage to conduct various projects and earn profits. With only modest financial support from the government, their biggest concern is how to keep human resources. Unfortunately, their highly-educated staff still emigrates.

It is also noticeable that a change in the structure of the employees has resulted in a concentration of R&D resources in the HEO sector considerably higher than the average value in OECD countries, and a very low concentration of R&D resources in the industrial sector (4-5 times lower than the average value in OECD countries). The RDI sector, which corresponds to the governmental sector under OECD classification, has a share in the national R&D system similar to average in OECD countries. A strong migration of researchers from RDI and RDU in industry to universities, recorded in nineties, is mainly a result of the search for more secure jobs - university staffs are moderately paid, but without major delays, contrary to the other sectors in that period.

The weakest point in RTD institutional support is lack of communication, both inward and outward, and very low level of commercialization and follow-up of scientific and research achievements. Several HEO, RDIs and RDUs appear to be moving towards providing some of the services commonly present in Western European countries, but there is no evidence of specialized services with a ‘technological extension’ type mission (i.e. individuals such as technology or R&D advisors who regularly visit enterprises to analyse their needs and put them in contact with organizations able to support them).

University faculties in general have not yet created commercialization services or well structured R&D and intellectual property units within their central administrations. So far, the only successful project of this type is the Innovation Center of the Faculty of Mechanical Engineering at the University of Belgrade, which has been established according to the Law of innovation in Serbia 2005., (more details in part 4).

A much under-studied aspect of R&D institutional support is the role played by standards, quality, intellectual property and metrology institutions. Although the proliferation of international standards and technical regulations is a relatively recent phenomenon, the current trends can be expected to increase the significance of capabilities embedded in these
institutions and their role in promoting industrial deepening and technological catch-up. Although several institutions in Serbian exist, like the Metrology institute, the Institute for standards, the Office for Intellectual Property, their performance is far below European level.

One of the basic problems in the functioning of the R&D sector with corresponding industry is the absence of the Research and Development Units (RDU) in industry, as a consequence of uncontrolled privatization in the previous years. Namely, before the beginning of the processes of privatization in 2000 year, in the majority of the large companies in Serbia, like Goša, Sartid, Zastava, Magnochrom, Zorka, Lola, Hemofarm, Galenika, RTB Bor and others, there existed R&D institutes, which after privatization were closed or transformed into units for other purposes. Only a small number of such institutions, by the intervention of the state in the period 2004-2007, was dislocated from their mother companies, and operates independently.

This process is 'natural’ for companies who wanted, through buying Serbian companies, to buy Serbian market, and the markets of neighboring countries, and not to develop the acquired enterprises. If the companies wanted to increase the productivity and profit, as it was why Sartid was bought by US Steel, they do it because of cheap labor and large industrial capacities. R&D of these companies is done in some other countries, they do not need it in Serbia.

There are multiple damages in localities where R&D units operated in large companies.

Firstly, R&D staff lose jobs, leave locality or change the profession, secondly, and more important, young people who commenced their studies, with the idea to eventually do master and PhD studies as well, hoping to get corresponding jobs in their home town or region, lost that opportunity. This causes unwanted and damaging migrations, as small communities are left without high quality citizens who will probably have a leading position in local society and be a positive example to young generations.

On the long run, this trend may have highly damaging consequences on the regional development of the Republic of Serbia. For example, Ireland in the previous period was the country with a leading position in economic transformations and foreign investments.
According to OECD data, now it has the largest contribution of working positions depending on foreign investors, Fig. 2.2.

![Figure 2.2. Largest contribution of working positions in foreign investment](image)

However, in the quest of investors for more cheaper but skilled labor (China, India, Brazil...), the production units are quickly and easily transferred from country to country. Momentary problems occurring in Ireland, Iceland and some other countries are the consequence of unsatisfactory development based on their own resources.

**Innovators**

The Register of Innovative Activities has been established in Serbia in 2006 year, on the ground of the Law of Innovation from 2005 year, as a data-base of individuals and innovative organizations, research development centers, production development centers and innovative centers (more details in Chapter 4) which have created an innovation or have potential to create one. Trend of registration of individual innovators an innovative organizations is presented in Figure 2.3.. By positioning in the Register, the state offered chances to all, to
apply for financial stimulus for development of innovation in Serbia. The total number of registered innovation organizations and individual innovators is given in Table 2.1.

Table 2.1. Applications in Register of Innovative Activities

<table>
<thead>
<tr>
<th>Innovators</th>
<th>D&amp;P Centers</th>
<th>R&amp;D Centers</th>
<th>Innovation Centers</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>52</td>
<td>22</td>
<td>5</td>
<td>207</td>
</tr>
</tbody>
</table>

Figure 2.3. Trend of applications to Serbian Register of Innovative Activities

It is evident from the above data, that after the adoption of the Law by the Serbian National Assembly in December 2005, there is a positive trend in registering of innovative subjects in following years. Somewhat lowered original registration criteria in 2008, brought about an increase in number of registrations and participations from the funds. At the same time the number of registered innovation organization maintained approximately the same level.

Promised corrections and supplementations of the Law, which were actually adopted by the Assembly in 2010, did not have the expected effect, and the number of new registered individual innovators and innovative organizations drastically dropped.
All that absolutely does not reflect the potentials of Serbia in this domain, and a more efficient communication of the responsible Ministry with all interested parties is necessary. Economical crisis, the responsibilities towards the research community, the time spent on the revisions of the existing laws on research and innovative activity, brought about such results.

Local governments

Among the most important partners, which in the future should have a central positions in the development of innovative activities in Serbia are the local self governments. At the moment, there are in Serbia more than 150 local governments, but the present situation does not encourage them to care about their own development. The reasons for that are multiple, from the centralization of the political and financial power, to the absence of leaders able to instigate development. Political subservience and the expectations of the help from the ‘above’, produced the atmosphere where there are very few examples of strong initiatives towards own development. Large opportunities provided in the first version of the Law of Innovation Activity, and also in that recently adopted, were not taken advantage of so far. Namely, the category of Research-development centers was established to help the local self-government to find in the community natural and human resources for the own development, determine the technological priorities and increase competitiveness. However, for the last 5 years, in spite of that opportunity, this evidently has not been recognized, and there does not exist a single innovative organization founded and owned by local self government. This situation could be largely improved by a more efficient propaganda from all partners in the innovative sector, probably also through media.

Media

Media are a very important partner in promoting innovative activity. In the present time education, science and development and particularly innovations are rarely present in national, and even less in local media. There are few journalists specializing or and experienced in these areas, but also in technology, patents and innovations. Exceptionally,
these topics are presented sensationally, frequently with over-estimation or superficially, at irregular times. All this relates to television, as the most powerful media.

Privatization of the media in Serbia in 2000 year, postulated profit as an ultimate aim, disregarding the importance of presenting information’s which could increase the creative consciousness in population. This situation is a consequence of insufficiently defined goals of the transition process, and the race for high popularity, which is true even for National Public Service and also the channels with national frequencies. The excuse is the low watching of these programs, although the other manifestation of that orientation are very popular, even to young generation. As in the other domains, it is necessary the change the consciousness about the importance of information on science, technology, innovation, including the pressure on TV editors.

So far there were no investigations on the popularity of the programs on science and technology development and innovations in Serbia, and the response of population is not known. A certain indication is that the finals of the Competition for the best technological innovation in Serbia, emitted by the National Public Service in the last five years, has been watched by 15% of the total population, which is about one million individuals. This means that there exist interest in the auditorium for that subject.

The experience of the national public service from the years before 2000, is important as it shows that the school program emitted in early morning was immensely popular, and watched not only by the young, but also by the grown-up population, contributing to general education and culture. That proves that there is space for such programs, but not enough good wishes and conscience with chief editors and proprietors of the media to think about it.

The improvements in this domain could be initiated and directed only from the Serbian Government by implementing legal solutions, implementing obligatory promotion of scientific and innovative activities in all media in Serbia.
3. Seven national R&D priorities

In the Scientific and technological development strategy of the Republic of Serbia 2010-2015, after the analyses of scientific fields in Serbia, identified of seven national priorities in the domain of science, technology and innovation:

- Biomedicine and human health
- New materials and nanosciences
- Environment protection and countering climate change
- Energy and energy efficiency
- Agriculture and food
- Information and communication technologies
- Improvement of decision making processes and affirmation of national identity

The following part of the text will explain these seven priorities derived from the above strategy, at the same providing the picture of the sector of “Small and Medium Enterprises and Entrepreneurship” (SMEs) that would be capable of enabling a dissemination of scientific and research results in the Serbian economy according to a current situation in Serbia.

Namely, as it has already been indicated in the previous chapter, the privatization of big Serbian companies resulted in a complete neglect of their sectors for research and development, thus at this moment there is almost no actual relationship between the sectors of big companies and scientific-research corpuses in Serbia, as it was the case in previous decades.

Therefore scientific-development priorities should be in line with the current capacities of the Serbian economy. Let's take into consideration the picture of seven R&D priorities first:

**Biomedicine and human health**

The preservation and improvement of human health is the key priority of each nation. Molecular biomedicine is introducing new approaches in modern medicine of the 21st
Review of the Innovation Process and the Corresponding Funding Possibilities in Serbia

century, with the purpose of improving the quality and efficiency of preventive medicine, diagnostics and therapy, and thereby also of clinical medicine.

Research directions in modern biomedicine are very versatile and achievements in this field have been applied in different fields of science and everyday life.

The major participants in the realization of biomedical projects are the following institutions: Institute of Medical Research, Institute of Molecular Genetics and Genetic Engineering, TORLAK-Institute of Immunology and Virology, Institute of Biological Research «Siniša Stanković» (IBISS), Institute for the Application of Nuclear Energy (INEP), Institute of Nuclear Sciences “Vinča”, National Cancer Research Center, IORS, Joint Center of Biochemical and Biomedical Engineering, University of Belgrade (JCBBE), Faculties of Medicine (Universities of Belgrade, Niš, Novi Sad, Kragujevac), Faculty of Pharmaceutics (University of Belgrade), Faculty of Biology (Universities of Belgrade, Niš, Novi Sad, Kragujevac), Veterinary Faculty (University of Belgrade), Military Medical Academy.

The individual segments of these programs are implemented at the Faculty of Chemistry and the Faculty of Technology and Metallurgy of the University in Belgrade, as well as within the framework of several research development centers.

On the base of projects data in Serbia, there are 106 ongoing projects in medical sciences, involving 905 researchers, as well as 61 projects in the area of biological sciences, involving 619 researchers. At the international level, which is rather modest for the time being, the following projects have been implemented: FP7: according to 2009 statistical data, of the 63 projects funded by the EC, and 3 are in the area of (bio)medicine, i.e. 4.7% of the total number. COST: of the 68 currently implemented actions involving Serbian researchers, 12 belong to the field of biomedicine i.e. 17.6%. (25)

The end users of research results and accomplishments are health institutions, the pharmaceutical industry and the food industry. Preclinical and clinical testing of drugs, medicinal substances, food additives, products in the domain of functional food and other categories of biologically active substances will be carried out for domestic and international companies.
New materials and nanosciences

The FP7 EU Framework Program defines nanosciences, nanotechnologies, materials and new production technologies (NMP) as one of the priority themes through which research is funded within the framework of the EU. Research in the field of materials and nanotechnologies in Serbia has proved to be compatible to that in Europe, as a result of which the major part of the scientific community in Serbia is oriented towards cooperating with the European Union, a fact indisputably supported by statistical data about the participation of our research-development organizations in European projects.

Considering the comprehensiveness and multidisciplinary character of the research in the field of new materials and nanotechnologies, they are carried out in a large number of scientific research organizations: Vinca Institute of Nuclear Sciences, Institute of Physics, Institute of Chemistry, Technology and Metallurgy, Multidisciplinary Research Institute, Technical Sciences Institute of the Serbian Academy of Sciences and Arts, the Faculty of Electrical Engineering, the Faculty of Physical Chemistry, the Faculty of Mining and Geology, the Faculty of Chemistry, the Faculty of Physics, the Faculty of Technology and Metallurgy, the University in Novi Sad: the Faculty of Technology, the Faculty of Technical Sciences, the Faculty of Natural Sciences and Mathematics, the University in Nis and the University in Kragujevac.

Serbia has 589 researchers engaged in 48 projects under the Technological Development and Basic Research programs in this domain, and took part in 83 projects under the FP6 Framework Program, while in the FP7 Framework Program Serbia has already been involved with 43 projects, and currently participates in 3 projects having NMP as a priority. (26)

The following classes of materials are of special interest and carry the greatest potential:

- Ceramic materials, in the form of bulk, thin films and coatings are materials produced from non-metallic inorganic compounds, and they have been widely used in the process industry, energy industry, as cutting tools, ballistic ceramics, in the aircraft industry, etc.
- Metal materials and intermetallic compounds with a broad industrial application in practically all the branches
• Composites, two- or multi-metal hybrids, very often comprising reinforced ceramics, metal or material with organic matrix, combining the best characteristics of their constituents, with implementation in the military industry, aircraft industry, etc. Nanocomposites used as electrocatalysts and their carriers, supercapacitors etc. are of particular importance.

• Biomaterials and biomolecular materials representing different types of materials compatible with human tissue and/or biological phenomena as well as materials of biological origin. Applied in pharmacy, medicine, dentistry and having particular significance in medical diagnostics, regenerative medicine and targeted therapy and malign diseases.

• Carbon nanostructures and nanocapsules, by introducing photosensitive sub-units nanoclusters are obtained with significantly altered photophysical characteristics, which enables their testing in nanobionics as well as in the field of photodynamic therapy of different diseases (malign diseases, viral diseases, neurotoxins)

• Materials for new and renewable energy sources such as materials for fuel cells, photovoltaics, nanocatalysts with application in transport devices, stationary energy units, batteries etc.

• Electronic materials, so called active functional materials, such as ionic conductors, sensors, semiconductors based on ceramics, polymers and metals, with application in electronic industry, information technologies, automotive industry, industry of household appliances, energy and all the branches of electronics and production management

• Magnetic materials based on metals, ceramics or organic materials. Application in automotive industry, audiovisual technology and information technologies, consumer electrical appliances, medicine, etc.

• Polymers, large molecules with other sequences are modern materials with programmed and accurately designed characteristics (liquid crystals and molecular machines, bio-nano particles, etc.). Textile fibers with particularly designed characteristics and with particularly treated surfaces, bactericidal deposits on textile, hydrophobic and hyperhydrophobic materials.

• Optical and photonic materials transmitting light or acting as light sources produced from glass in different shapes (optical fibers) or complex functional materials having a significant role in modern communication systems,

• Eco materials are materials using renewable raw materials for their synthesis and/or materials whose environmental impact is of prime significance. Characteristic examples are geopolymers with application in the building industry, transport, mining, agriculture, etc.
Environment protection and countering climate change

In recent decades it became evident that our global environment is seriously threatened by the consequences of human activities leading to comprehensive pollution of water and air, depletion of natural resources, as well as forest and fish stocks, extinction of plant and animal species and their habitats and to a growing threat of global warming.

Big pollution of natural resources, water primarily, as well as soil and air, in Serbia and the fact that the climate changes are much faster than anticipated show the need for prioritizing environmental sciences in the strategy of scientific and technological development.

A great number of science research institutions are in a way included in research in the domain of environmental protection. That research mostly involved: the Faculty of Forestry, Faculty of Agriculture, Faculty of Biology, Technology - metallurgy faculty and Faculty of civil engineering of the University in Belgrade, Faculty of natural sciences and mathematics, Mechanical engineering faculty and the Faculty of agriculture of the University in Novi Sad, Faculty of agriculture in Cacak, Faculty of natural sciences and mathematics, Technological faculty and Faculty of ergonomics of the University in Nis, and numerous institutes: Institute of soil, Forestry institute, Water management institute "Jaroslav Cerni", Institute for plant protection and protection of the environment, Institute of valley forestry and the environment etc., and other institutions: the Republic administration of hydrometeorology, Nature protection administration, Public Health Institute Belgrade, and others.

Ministry of science and technological development, (MSTD) is currently financing 144 science research projects in the field of environmental protection. The total financial support for the projects connected with the protection of environment and climate change in all the domains of science in 2008 amounted to 9.7 million Euros, which accounts for 9.7% (2.3% in the basic research and 7.4% in the program of technological development) of the whole budgetary allocations for science and technological development. In addition to the projects financed by MSTD, in 42 projects of the framework programs FP 5, 6, and 7 the share of science research institutions from Serbia was 1.37 million Euros, which is a modest result.\(^{(27)}\)
Priority of research of environmental protection and climate change may be classified into the following main groups:

- Development of technology for the protection of environment
- Integrated management of the protection of the environment (quality of water, air, soil)
- Scientific monitoring of eco systems and protection of biodiversity
- Environmental hazards and eco systemic risk assessment
- Monitoring and research of climate change and its impact on the environment

**Energy and energy efficiency**

Energy is a strategic infrastructure of a country necessary for its overall development and security. Serbia is not self-sufficient in terms of energy resources, hence it has to import larger part of its strategic energy generating products (oil, gas and high quality coal), and a portion of energy equipment, particularly that which is modern - efficient and ecologically acceptable.

That is why, in addition to safe supplies of energy its rational consumption is at stake, in the strategic interest of Serbia and reduction of import dependence and reconstruction and expansion of domestic manufacturing of energy equipment and equipment for the protection of the environment, contributing to the reduction of unemployment rate.

Serbia is unavoidably facing the introduction of new, efficient ecologically friendly energy technologies, technology for dislocated energy generation, technology for the protection of environment, technology of use of low quality fuels, biomass, off balance coal reserves, coals from underground exploitation, technologies for the use of renewable sources of energy (RSE): biomass, small hydro power plants, wind energy, geothermal energy, energy of the sun, household and industrial wastes. On the one hand it would require an investment effort but on the other a challenge for science and technological development and the opening of new production.

Unlike relatively well developed energy generation, the culture of energy efficiency is underdeveloped. The main reason is inadequate market valuation of the generated electrical energy reflected in irrational and inefficient energy management of output. Hence, slight
lagging behind is evident in the research of new technologies for energy generation, ecologically friendly and from renewable sources.

About 750 researchers are engaged, investments by MSTD have been at the level of 4 million Euros a year, while the research equipment in the past was very poorly funded.

Priority themes for research in the energy generation and energy efficiency:

• Increased energy efficiency in generation, distribution and use, with special attention for higher energy efficiency of buildings
• Development of new technologies for the exploitation of renewable sources of energy and clean technologies with zero emission, primarily small hydropower stations, cogeneration and use of biomass
• Contemporary metering techniques of energy consumption, monitoring and optimal automatic control
• Efficient use of existing mines and exploration of new deposits

Agriculture and food

The experience so far suggests that for each country it is important to have good quality science research and teaching institutions. They are imperative for the development of each country. Their mission in the future should resolve, guide and review the needs of producers and consumers in the long run.

Today in Serbia agro industry has a share of some 20% in the social product of the country. Serbia has very favorable natural conditions for versatile agricultural production, experienced producers, supreme experts and scientific staff. Since 2005 Serbia has positive trade balance on exports of agricultural and food products, the share of which was 20% in the total exports, far more than other Western Balkan countries (some 10%). In 2008, the total agrarian trade of Serbia with the world amounted to over 2 billion USD or by 16% above 2007. Export of seeds is especially significant because hybrids and varieties created in our research organizations are being exported. It is worth mentioning that our varieties and hybrids have a competitive edge on the international market where more than 3 million hectares were
annually sown with our varieties and hybrids. Scientists have developed optimum technologies in several disciplines, relying mainly on the traditional biotechnical methods and procedures.

The main proponents of the projects in this area are: Plant and vegetable institute of Novi Sad; Maize institute "Zemun Polje", Belgrade; Institute of food technologies, Novi Sad; Fruit growing institute, Cacak; Stock breeding institute, Belgrade; Institute of meat hygiene and technology, Belgrade; Soil institute, Belgrade; Vegetable institute, Smederevska Palanka; Institute of pesticides and protection of the environment, Belgrade; Medicinal herbs "Josip Pancic" institute, Belgrade, Institute of plant protection and the environment, Belgrade; Fodder institute, Krusevac; Veterinary institute of Serbia, Belgrade; Veterinary institute "Novi Sad", Novi Sad; Institute of agricultural economics, Belgrade; Agricultural faculty in Zemun, University of Belgrade; Agricultural faculty and Technological faculty in Novi Sad, University of Novi Sad; Faculty of agronomy in Cacak, University of Kragujevac; Veterinary faculty in Belgrade, University of Belgrade; Chemistry faculty in Belgrade, University in Belgrade; Technology and metallurgy faculty in Belgrade, University in Belgrade.

The total number of projects financed is 117 with more than 1,300 researchers. Investments into this area went up more than six times compared to 2002 and reached over 12 million Euros for the year 2008. (29)

In recent years, it was the most visible area internationally. Thus, in the FP 7 program of EU "Cooperation" within the thematic area "Food, agriculture, fishery and biotechnology" the research groups from Serbia ranked at the European average according to success rate (about 17% success rate). In COST (12 of 83), EUREKA (5 of 36), NATO and other international programs the Serbian researchers partake, and in the bilateral cooperation programs, alike.

Future research priorities in the area of agriculture and food should include the following thematic frames:

• Bio rational use, higher fertility, remediation and soil protection
• Evaluation and use of cultivated and wild genetic resources by means of the conventional and molecular methods of crossbreeding to obtain productive varieties/hybrids/breeds, which shall serve as a basis for the production of safe, functional, nutritive and special food
• Advancement of knowledge in sustainable management, production and use of biological resources
• Development of new technologies and products in the food processing industry and technology based on traditional products
• Research and development of application of new enzymes and micro organisms in bio processes, new products, production of biomass

Information and communication technologies

Information and communication technologies (ICT) are the most dynamic technological area of crucial importance for sustainable development and advancement of each society.

ICT is well developed in Serbia and constitutes an important branch of both the economy and science. In the area of software development and partially hardware, there are several companies dealing with the placement of knowledge and are good market players, at the level of the region, too. As to the production of hardware, the existing modest local technology is unfortunately unprotected, and un-encouraged. Sudden drop of industrial capacities in military and related industrial spin offs resulted in the halt in production and general orientation to the import of most products, even in the presence of local substitutes.

Approximately 700 researchers are involved, investments by MSTD are at the level of 5.5 million Euros a year, while new research equipment in the last three years was funded with half a million Euros.

Research priorities in ICT
• Installed electronic systems - manufacturing of equipment and software, modeling and optimization 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;

- Intelligent 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 digitalization - computerization of all library and archives stocks in Serbia, accessibility via internet, digitalization of all publicly accessible property, presentation of all cultural and natural goods
- Telecommunication systems of broad band access and digital transmission - research, development, demo equipment and devices for fiber glass and wireless telecommunications, digital TV, multimedia facilities
- Radar and infra red 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

Improvement of decision making processes and affirmation of national identity

Serbia has a strong multi ethnic and multi confessional character, the affirmation of which is a factor of tolerance, diversity and riches of cultural heritage and life in such a society. At the same time, Serbia is an important pre-historic, Roman, Byzantine, etc. country. Validation of such heritage testifies to the deep European roots of Serbia.

On the other hand, social sciences and humanities are an irreplaceable resource for reform in society. They play the key role in defining the strategies of public policies, identification of possible options, optimization of functional institutions, enhancement of human resources and the system of management and achievement of selected objectives, comparison with the
international experiences and achievements, introduction of the system of monitoring the results accomplished and corrective measures. Many of the most developed countries have, within different tiers of power, teams devoted to strategic planning and public politics. Social sciences and to some extent humanities are their main intellectual support. This role is of major importance for countries in transition on the way to EU membership.

In the period to come, the role of social sciences and humanities will be of key importance in the following domains:

• Affirmation of the role of social sciences in formulating public policies
• Support to integration processes
• Completion of capital projects: dictionary, atlas, spelling rule book, etc.
• Affirmation of national history and culture heritage

**Current state in the SMEEs sector**

In the early stages of technological activity enterprises do not need formal R&D departments. As they mature, however, they find it increasingly important to monitor, import and implement new technologies. The role of formal R&D grows as a firm attempts significant technological improvements and tackles product or process innovation. For complex and fast-moving technologies it is an essential part of the technological learning process.

The Serbian economy has historical concentrations of employment and production in a number of sectors including agri-business, automotive and component production, textiles and wood and furniture industry. Major export products include steel, tires for motor vehicles, fruits (notably raspberries), plastics and medicines. Emerging and fast growing sectors include electronics with segments such as computers and office equipment growing rapidly. However, the share of total employment located in medium/high technology manufacturing and employment in high-tech services are both significantly below European levels.

Rates of investment in innovation expenditure are very low and most of the innovation activity is concentrated in the acquisition of machinery and equipment and related training.
This phase of dissemination of new and updated technologies within Serbian enterprises is crucial and has been witnessed in most other transition economies.

Yet, in order to move from this ‘investment phase’ in development terms from which a boost to labour productivity can be expected, to an innovation driven phase where the economy shifts to higher value added products creating greater wealth and securing longer-term competitiveness, enterprises will need to invest more in R&D, in partnership with academic and other not-for-profit research institutes.

The analysis of the status in the SME sector was made on the basis of the available data for 2008 presented in the regular annual report on the SME sector and published during 2009 by the Ministry of Economy and Regional Development as the ministry in charge of this sector.

In view of a clear identification of different subjects that may be found within the SME sector, a division has been made to micro, small and medium enterprises (SME) and entrepreneurs. The above classification was made on the basis of number of employees, as follows: micro enterprises – with the number of employees up to 9, as well as entrepreneurs (shops) and natural persons individually performing a business activity, small enterprises – with the number of employees between 10 and 49 and medium enterprises – with the number of employees between 50 and 249 (all enterprises with more than 250 employees belong to the category of big companies).

According to the data available in the Ministry of Economy and Regional Development, a growth of GDP of 5.4% during 2008 was identified in Serbia. This was made although the growth slowed down in the last quarter and under the impact of negative effects of the world financial crisis.

Since it was very adaptable to the economic conditions, the SME sector significantly contributed to the generated economic growth, with the generated 66.6% of total turnover and 59.1% gross added value of a non-financial sector. The profitability of this sector, i.e., the generated profit on the invested capital is at the level of profitability of the overall non-financial sector in Serbia.
Although the number of economic operators rises in Serbia, to reach 303,449 economic operators in 2008, a tendency of establishing an enterprise has decreased (newly-established SMEs in comparison to active ones) from 22.3% in 2006 to 18% in 2008, while the winding rate has increased from 10.6% to 13.2% in the same period.\(^{(31)}\)

The increase of the number of SMEs itself does not lead to the improvement of the structure of this sector since micro enterprises with the share of 95.7% still dominate in it. Similarly to previous years, the unfavorable tendency of SMEs concentrating in only two sectors has remained (Wholesale and Retail sale and Processing Industry) and mostly in two most developed regions (City of Belgrade 29.3% and South Backa Region 9.2%). Further, the products of low-technological sectors dominate in the exports of the processing industry. On the other hand, the main burden of the transition process with respect to the creation of new job posts has been identified in the SME sector. During the period 2004-2008 the number of jobs was increased by 24.9% (187,419 employees) and in that way neutralized the decrease in the number of employees in big companies due to restructuring (163,620 employees or 26.3%). The SME sector is a net creator of new job posts.

In parallel with the increase of number of new job posts and the number of job posts, the increased investment activity has also been identified in this sector. At the level of overall Serbian industry, the SME sector participates with 48.1% in the investment structure and with 58.7% in the non-financial sector structure. The share of this sector's investments has been increased in the gross added value (from 29% in 2006 to 40% in 2007) and in 2007, it was at the level of the share in non-financial sector. A very important indicator of tendencies in this sector refers to the investment structure of the SME sector since it is obvious that this sector channels almost a half of its investments into equipment which may have a positive effect on the growth of production/services and competitiveness in the period to come, but the unfavorable issue refers to a comparatively high percentage of investments into construction works (42.6%) which may not be regarded as productive.

With regard to costs of work and costs of work per hour spent, the SME sector is below the average value, which points to above-average cost competitiveness of the sector enabling it a
flexibility and adaptability to more complex conditions of a business environment to a great extent, as is the case in Serbia.

When comparing the development level of the SME sector in Serbia and the EU countries, the SME sector in Serbia shows to be at the EU average level according to the share in the number of enterprises and employment, as well as according to the generated turnover and gross added value. However, the SME sector in Serbia falls behind the average EU level with respect to the turnover per employee, gross added value per employee and profit per employee. At the same time, the comparative analysis of investments per employee and investments per enterprise in the neighboring countries and EU-27 shows to a significantly lower level of these indicators in Serbia, both with respect to the SME sector and to the overall economy. Total investments per employee in the SME sector in Serbia amount 4.100 EUR (the EU average - 7.400 EUR), while the investments per enterprise amount 12.200 EUR (the EU average - 31.700 EUR). (32)

There is a regular and enormous increase in foreign trade deficit as a regular consequence of a transition process in the countries undergoing it due to different promises of international subjects leading to the increased foreign trade activity. This developed mechanism leads to the increased number of countries depending on their creditors, debts become greater and the country finds itself in the situation of being a debtor forever and ranked lower than it should be on the basis of its possibilities and potentials and prevented from developing them in the appropriate manner.

It results in the non-competitiveness of exports and domination of products of lower processing phase, mainly raw materials and semi-finished products.

The data illustrating this show that the total foreign trade activity of the Republic of Serbia in 2008 amounted 23 billion EUR which was by 15.4% greater than in 2007. The export of goods was increased by 15.5% and imports by 15.3% with the increase of trade deficit balance that in 2008 amounted 8.2 billion EUR. The coverage of import by export remained almost unchanged and amounted 47.7% not to change in the last year which leads Serbia to the position of over-indebted in the long run.
This results in a high deficit of the current payment balance representing a key macroeconomic non-balance with a tendency of constant growth from 10.1% in 2006 to 15.9% in 2007, and 17.5% in 2008 respectively, which has an immediate impact on the Serbian industry export of 22.1% GDP, while imports participates in the GDP with 46.3%.

Researches made by the World Bank (Doing business 2009)\(^{(33)}\) show a deterioration in a business environment of the Serbian industry and the 94th position in the list including 181 countries (ranked 91st in 2007)\(^7\). Compared to the countries in the region, Serbia is better ranked than Croatia (ranked 106th) and Bosnia and Herzegovina (ranked 119th), and worse ranked than Hungary (ranked 41st), Romania (ranked 47th), Slovenia (ranked 54th), Macedonia (ranked 71st), Albania (ranked 86th) and Montenegro (ranked 90th).

Serbia increased its competitiveness during the period between 2004 and 2006, but its competitiveness decreased on year after by the change of the Serbian Government and new elections, Figure 3.1.

![Figure 3.1 Competitiveness of Serbia\(^{\text{(34)}}\)](image-url)
The comparative analysis of dynamics and the rate of improvement of business indicators with the neighboring countries show a tendency in slowing down industrial reforms in Serbia with all negative consequences to the total competitiveness of the industry.

In 2005, Serbia was a leader in the implementation of reforms and in 2007 there was no progress in any of 10 basic indicators subject to monitoring and describing the level of implemented reforms, while in 2008 the improvement was made only in the sphere of property registration.

The unchanged values of basic indicators show that there was no significant improvement of business environment during previous years. Structural reforms slowed down and they were not strong enough to absorb negative consequences of transition processes.

The SME sector has a significant impact on the business indicators of all industrial sectors other than in sectors: Ore and stone extraction, Electrical energy, gas and water and Traffic, warehousing and communications, dominated by big companies.

Within the SME sector, the enterprises within the sector Trade (108.372 enterprises or 35,7%) and Processing industry (51.625 or 17,0%) employ 40.7% employees who generated 47.1% turnover and 33.2% gross added value of non-financial sector in Serbia in 2008. (35)

The sector distribution of SMEs is very concentrated since 73.9% of enterprises, 78.6% of employees, 85.3% of turnover and 80.1% of gross added value of the SME sector in 2008 were distributed in four sectors:
- Trade,
- Processing industry,
- Real estate affairs and leasing and
- Construction works.

If the sector of processing industry is taken into consideration that should be the greatest absorbent of new scientific-research achievements and innovations by rule, its structure is as follows, Table 3.1:
Table 3.1: Indicators of the SME sector within the processing industry in 2008 according to technological structure (in %)\(^{36}\)

<table>
<thead>
<tr>
<th>Branches</th>
<th>Number of companies</th>
<th>Number of employees</th>
<th>Turnover</th>
<th>Gross Added Value</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing industry SME total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Low technological sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foodstuff, beverages and tobacco</td>
<td>64.1</td>
<td>59.3</td>
<td>52.5</td>
<td>52.1</td>
<td>51.2</td>
<td>36.9</td>
</tr>
<tr>
<td>Textile and textile products production</td>
<td>18.7</td>
<td>24.2</td>
<td>26.8</td>
<td>21.9</td>
<td>21.3</td>
<td>9.2</td>
</tr>
<tr>
<td>Leather processing and production of leather items</td>
<td>13.0</td>
<td>11.6</td>
<td>4.7</td>
<td>7.0</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Wood processing and wood products</td>
<td>1.7</td>
<td>2.7</td>
<td>0.9</td>
<td>1.6</td>
<td>3.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Paper production, publishing and press</td>
<td>9.1</td>
<td>5.3</td>
<td>3.8</td>
<td>3.7</td>
<td>3.2</td>
<td>2.9</td>
</tr>
<tr>
<td>Other processing industry</td>
<td>10.7</td>
<td>7.4</td>
<td>6.7</td>
<td>6.3</td>
<td>8.9</td>
<td>6.0</td>
</tr>
<tr>
<td>Medium to low technological sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke and oil derivates production</td>
<td>25.4</td>
<td>22.9</td>
<td>23.3</td>
<td>23.7</td>
<td>24.6</td>
<td>26.6</td>
</tr>
<tr>
<td>Production of rubber and plastic products</td>
<td>0.1</td>
<td>0.3</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Production of products of other minerals</td>
<td>5.5</td>
<td>5.1</td>
<td>5.0</td>
<td>5.3</td>
<td>5.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Production of metal and metal products</td>
<td>5.1</td>
<td>4.5</td>
<td>4.3</td>
<td>4.7</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Medium to high technological sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of chemical products and fibres</td>
<td>14.8</td>
<td>12.9</td>
<td>13.4</td>
<td>13.2</td>
<td>16.0</td>
<td>15.5</td>
</tr>
<tr>
<td>Production of other machines and devices</td>
<td>5.3</td>
<td>11.1</td>
<td>13.8</td>
<td>14.5</td>
<td>18.2</td>
<td>18.3</td>
</tr>
<tr>
<td>High technological sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of electrical and optical devices</td>
<td>2.1</td>
<td>3.6</td>
<td>7.6</td>
<td>6.3</td>
<td>5.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Production of means of transport</td>
<td>2.4</td>
<td>4.6</td>
<td>3.5</td>
<td>4.7</td>
<td>5.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Production of means of transport</td>
<td>0.8</td>
<td>2.9</td>
<td>2.6</td>
<td>3.6</td>
<td>6.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Production of electrical and optical devices</td>
<td>5.1</td>
<td>6.8</td>
<td>10.4</td>
<td>9.7</td>
<td>5.9</td>
<td>18.3</td>
</tr>
<tr>
<td>Production of electrical and optical devices</td>
<td>5.1</td>
<td>6.8</td>
<td>10.4</td>
<td>9.7</td>
<td>5.9</td>
<td>18.3</td>
</tr>
</tbody>
</table>

At the same time, according to the regional distribution, it may be noted that over 99% enterprises in this counties come from the SME sector (all enterprises in Toplica County) and employing more than 60% employees in those counties, other than in Belgrade with 56.9% as an administrative centre and the county of Bor with 59.7% due to the industrial complex of RTB Bor.

The SME sector has a prevailing impact on structuring of turnover and gross added value of all counties in Serbia. Big companies have a dominant impact only on the amount of generated turnover in the South Backa County and the County of Podunavlje, and on the generated gross added value in the County of Podunavlje, Branicevo and Bor.

The greatest share in the SME sector structure in Serbia goes to the enterprises from the territory of the City of Belgrade and the South Backa County with 38.5% (88.872 or 29.3% and 27.991 or 9.2%, respectively) employing 41.6% employees (293.352 or 31.2% and
98.088 or 10.4%) and generating 55.1% turnover (2.054.2 billion RSD or 44.1% and 514.4 billion RSD or 11.0%) and 55.5% gross added value of the SME sector (374.7 billion RSD or 44.7% and 90.0 billion RSD or 10.7%), Table 3.2.

**Table 3.2**: Participation of counties per certain indicators of development of SMEs in 2008 in % (36)

<table>
<thead>
<tr>
<th>SME Sector total</th>
<th>Number of companies</th>
<th>Number of employees</th>
<th>Turnover</th>
<th>Gross Added Value</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Belgrade</td>
<td>29,3</td>
<td>31,2</td>
<td>44,1</td>
<td>44,7</td>
<td>34,7</td>
<td>61,3</td>
</tr>
<tr>
<td>North Backa County</td>
<td>2,6</td>
<td>3,3</td>
<td>3,0</td>
<td>2,9</td>
<td>3,8</td>
<td>3,9</td>
</tr>
<tr>
<td>Mid Banat County</td>
<td>2,1</td>
<td>2,2</td>
<td>1,7</td>
<td>1,8</td>
<td>2,0</td>
<td>0,7</td>
</tr>
<tr>
<td>North Banat County</td>
<td>1,6</td>
<td>2,0</td>
<td>1,5</td>
<td>1,8</td>
<td>2,8</td>
<td>0,9</td>
</tr>
<tr>
<td>South Banat County</td>
<td>4,3</td>
<td>3,7</td>
<td>3,4</td>
<td>3,1</td>
<td>2,5</td>
<td>1,6</td>
</tr>
<tr>
<td>West Backa County</td>
<td>2,2</td>
<td>2,5</td>
<td>1,8</td>
<td>1,9</td>
<td>1,7</td>
<td>0,6</td>
</tr>
<tr>
<td>South Backa County</td>
<td>9,2</td>
<td>10,4</td>
<td>11,0</td>
<td>10,7</td>
<td>11,7</td>
<td>9,1</td>
</tr>
<tr>
<td>County of Srem</td>
<td>4,1</td>
<td>4,4</td>
<td>3,9</td>
<td>4,1</td>
<td>7,0</td>
<td>3,4</td>
</tr>
<tr>
<td>County of Macva</td>
<td>3,8</td>
<td>3,5</td>
<td>2,9</td>
<td>2,5</td>
<td>3,7</td>
<td>1,7</td>
</tr>
<tr>
<td>Kolubara County</td>
<td>2,7</td>
<td>2,1</td>
<td>1,7</td>
<td>1,8</td>
<td>2,4</td>
<td>0,9</td>
</tr>
<tr>
<td>County of Podunavlje</td>
<td>2,4</td>
<td>1,9</td>
<td>1,4</td>
<td>1,6</td>
<td>1,1</td>
<td>0,5</td>
</tr>
<tr>
<td>Count of Brancevo</td>
<td>2,2</td>
<td>1,7</td>
<td>1,3</td>
<td>1,1</td>
<td>0,6</td>
<td>0,4</td>
</tr>
<tr>
<td>County of Sumadija</td>
<td>3,9</td>
<td>3,6</td>
<td>2,9</td>
<td>2,9</td>
<td>2,4</td>
<td>2,3</td>
</tr>
<tr>
<td>County of Pomoravlje</td>
<td>2,8</td>
<td>2,4</td>
<td>1,9</td>
<td>1,7</td>
<td>1,0</td>
<td>0,9</td>
</tr>
<tr>
<td>County of Bor</td>
<td>1,2</td>
<td>1,2</td>
<td>1,2</td>
<td>0,7</td>
<td>3,9</td>
<td>1,3</td>
</tr>
<tr>
<td>Zajecar County</td>
<td>1,3</td>
<td>1,3</td>
<td>0,7</td>
<td>0,7</td>
<td>0,6</td>
<td>0,2</td>
</tr>
<tr>
<td>Zlatibor County</td>
<td>3,9</td>
<td>3,4</td>
<td>2,3</td>
<td>2,5</td>
<td>3,6</td>
<td>1,2</td>
</tr>
<tr>
<td>Morava County</td>
<td>3,4</td>
<td>3,6</td>
<td>3,4</td>
<td>3,3</td>
<td>4,5</td>
<td>3,1</td>
</tr>
<tr>
<td>County of Raska</td>
<td>3,7</td>
<td>3,2</td>
<td>2,2</td>
<td>2,3</td>
<td>2,4</td>
<td>1,4</td>
</tr>
<tr>
<td>County of Rasina</td>
<td>3,0</td>
<td>2,4</td>
<td>1,7</td>
<td>1,6</td>
<td>1,4</td>
<td>0,9</td>
</tr>
<tr>
<td>County of Nisava</td>
<td>4,4</td>
<td>4,4</td>
<td>3,2</td>
<td>3,0</td>
<td>2,9</td>
<td>2,3</td>
</tr>
<tr>
<td>Count of Toplica</td>
<td>1,0</td>
<td>0,8</td>
<td>0,4</td>
<td>0,5</td>
<td>0,3</td>
<td>0,1</td>
</tr>
<tr>
<td>Pirot County</td>
<td>1,0</td>
<td>1,1</td>
<td>0,5</td>
<td>0,6</td>
<td>0,4</td>
<td>0,2</td>
</tr>
<tr>
<td>Count of Jablanica</td>
<td>2,1</td>
<td>2,0</td>
<td>1,3</td>
<td>1,1</td>
<td>1,3</td>
<td>0,6</td>
</tr>
<tr>
<td>County of Pcinja</td>
<td>1,9</td>
<td>1,7</td>
<td>0,9</td>
<td>1,0</td>
<td>1,2</td>
<td>0,5</td>
</tr>
</tbody>
</table>

The existing differences in the level of development may be identified through the analysis of gross added value per employee of the SME sector per certain counties. The generated gross added value per employee is biggest in developed counties (City of Belgrade and South Backa County), and all enterprises at the territory of the City of Belgrade have the above-average gross added value per employee, as well as medium enterprises in South Backa County. The
level of development of the SME sector in Serbia measured by the indicator of gross added value per employee shows that the ratio of the county with the most developed SME sector (Belgrade) and the county with the least developed SME sector (Pirot) 2.8:1.

If you analyze gross added value per employee of the SME sector, only the city of Belgrade exceeds the average of non-financial sector in Serbia. Within the SME sector, the SMEs of the City of Belgrade and South Backa County are above average, micro enterprises from West Backa, Podunavlje and Branicevo County and medium enterprises from the County of Srem, Sumadija and Morava Counties.

Big companies have a dominant impact on the amount of generated export and import in most of the counties, in particular in Pirot County (91.4% of export and 72.6% of import) and the County of Podunavlje (96.2% and 92.9%).

The foreign trade activity of SMEs is concentrated in the City of Belgrade and South Backa County37. To illustrate this, 6,469 exporters generated 127.5 billion of RSD of exports (21.3% of non-financial sector, 46.4% of exports of SMEs), and 12,532 importers generated 529.8 billion of imports (42.7% of non-financial sector, 70.5% of SMEs imports).

The greatest deficit was generated by the SMEs38 from the territory of:
- The City of Belgrade (3/4 of total deficit) and
- South Backa County (10%).

Surplus was generated by SMEs from 5 counties:
- Zlatibor (1.191.0 billion RSD),
- North Banat (1.104.0 billion RSD),
- Bor (706.7 million RSD),
- Zajecar (356.6 million RSD) and
- Toplica County (250.8 million RSD).

Medium enterprises are the greatest exporters and importers in almost all counties and within the SME sector, other than in exports of Podunavlje, Branicevo and Rasina county, dominated by small enterprises and of Bor county dominated by micro enterprises, and in imports of
South Backa, Macva, Branicevo, Sumadija, Zlatibor, Morava, Nisava and Rasina Counties, dominated by small enterprises, and Bor and Raska County dominated by micro enterprises.

If priorities in scientific-technological development described in the first part of this chapter are taken into critical consideration with the data on the SME sector, one big misbalance is identified between wishes and possibilities. Namely, the wish of scientific-research sector to achieve top results in certain spheres is contrasted to actual possibilities to easily implement some easily applicable results in the Serbian economy.

The whole strategy deals with the period by 2015 which is a comparatively short period so it cannot be seen what sector of the Serbian industry could be more intensively supported by significant scientific-research results on the basis of participation of certain fields, nor any target region could be identified whose activity could be significantly improved through the increase of competitiveness in the relevant period.

A declarative orientation towards scientific-research priorities not based on the actual economical situation in Serbia shows the old practice that the results of scientific and research work do not have their implementation in the Serbian economy that provides funding for such results. Except for personal affirmation of researchers, potential increase of scientific papers and individual cases of contribution to world science, and in rare cases to the economy of other countries, there will be no actual significant results that would contribute to the GDP growth in Serbia.

In most developed countries, investments in science represent the most serious investments that bring benefits to the whole society by implementation in new products.

Allocations of budget funds to scientific issues in Serbia in the last several decades were not significantly implemented through the Serbian economy, thus it becomes an actual cost for the state instead of an investment. For example, investments in researches in chemistry amount around 10 million of Euro at the annual level, although no new chemical synthesis based on local researches has been released in Serbia in the last ten years, neither any new active substance has been produced that might be applied in chemical or pharmaceutical
industry. Even those researchers who made individual and valuable achievements have had no opportunity to apply such results in a fast and efficient way, therefore they remained at the experimental level or in the form of reports on paper.
4. Current and draft legal framework

The innovative activity together with a scientific and research activity represents the most significant driving power to the total technological development of one country as confirmed by the most contemporary world experience both from developed western countries and the countries undergoing transition process.

In order to achieve a necessary level of competitiveness and competence of both economy and all other segments of a society, it is necessary that the condition of constant improvement and development should be established, and/or innovative society should be established as an utmost end.

In order to achieve this, organizational and legal infrastructure should be established and the level of innovative society will be achieved in such environment in the most efficient way. It may happen only if visible results are achieved and applied in local and regional development, as well as in the whole country, based on globally competitive and competent scientific, research and development activities. A special objective of the society such as Serbian one at this moment must be the establishment of conditions for as short and as efficient application of scientific and innovative results in the economy as possible, so that the necessary time from the creation to the commercialization of an innovation could be reduced to the level required at world market at this moment.

It is only when Serbian citizens have changed their views and adopt the approach that only with development and creation of innovations Serbia could keep pace with technological race at the world market, a more significant progress could be expected from the lowest positions at which the state is at this moment in comparison even with the neighbouring countries that used to be far behind it in the past according to many indicators.

Since the utmost objective is to achieve the level of an innovative society, numerous inter-steps should be made during that process, and in the first place it is necessary that the following should be established:

- organizational units,
- functional mechanisms and
activities,

that may encourage the total research-development and innovative activity at all levels in the Republic of Serbia.

In order to achieve this it is necessary:

1) that system conditions should be established so that newly created and accumulated knowledge, as well as inventiveness could be main drivers and the basis for economic and social development of the Republic of Serbia;

2) that the existing infrastructure should be maintained and the creation of a new one encouraged since they are necessary for developing and applying scientific results and innovations in view of a dynamic development of the Republic of Serbia;

3) that conditions for employing persons with high professional qualifications in the Republic of Serbia should be constantly established, as well as the conditions for the return of professionals that have left the country for a temporary period of time;

4) that the principles of competitiveness and cooperation should be applied as basic driving elements of development;

5) that all potentials of a society should be involved in view of constant establishment and development of innovations.

The basic obstacle to the implementation of these principles is the existence of a gap between the existing capabilities of the economy to accept and realize new ideas on one hand and the results and researches that research-development and innovations sector deal with on the other hand.

It is a result of a difficult crisis period that Serbia went through during the past period, which caused that a developmental component in industry and everyday life decreased to the level that it became so low to impact the competitiveness of our country in comparison to other countries.

The basic objective of such approach is to enable that the economy and research-developmental and innovative potential become closer at the whole territory of the Republic
of Serbia, in the integrated manner and in line with international experience, and at the same time in line with our potentials.

In order to achieve this, the adopted statutory solutions must be consistently applied.

Unlike scientific-research activity, the innovative activity in Serbia had not been legally defined until 2005, when the Parliament of the Republic of Serbia adopted the Law on innovative activity for the first time ("Official Gazette of the Republic of Serbia", no. 110/2005), as well as its amendments ("Official Gazette of the Republic of Serbia", no. 18/2010).

While the law relating scientific-research activities introduced certain new elements in 2005 such as the establishment of the National Council of Science and the continuity of the activity in comparison to the previous period was still in place, the Law on innovative activity defined the innovative activity for the first time and how it should be organized.

Amendments to both laws that were adopted during 2010 have not changed the basic intent that was defined by statutory solutions as of 2005.

One of the basic problems in the period before the adoption of the Law on innovative activity was the problem to identify the total innovative potential that Serbia disposed of. There was also a problem of identifying expert groups in certain spheres by potential users of such potential. Thus the establishment of records of human resources and infrastructural potential in this field, as well as records of projects and achieved results was one of the priorities. The establishment of the Registry of innovative activity created a recognizable and easily accessible database enabling their faster connection with potential economic users.

In order to clearly differentiate those enterprises that invest in the research and development compared to those that do not do that, as well as in order to establish the conditions to stimulate them more strongly, the Law on innovative activity introduced the categories of highly-technological and medium-technological enterprises.
The companies investing in research and development more than eight percent of their expenditures at the annual level are registered as highly-technological companies in the Registry, while the companies investing between three and eight percent of their expenditures at the annual level are registered as medium-technological companies.

However, as of 2005 there has been no clear progress in this sphere since the fiscal policy has neither identified such companies, nor provided support that such companies could be recognized in the society and stimulated for further progress.

**Main clauses of the Law on innovative activity**

The introductory part of the law defines the subject matter of the law and basic definitions such as innovative activity, innovation and innovative policy.

The innovation in terms of this Law means the transformation of the idea into a new product, procedure or organizational form, as well as their improvement in comparison to the existing solution.

A scientific innovation is a product of a scientific-research work that may be evaluated through a new product, procedure or organizational form.

A technological innovation is a new product, new process or significant technological modification of the existing products and processes, realized at the market (productive innovation) or in a productive process (process innovation).

An organizational innovation is the introduction of a new form of organization showing a greater efficiency in comparison to the previous manner of organization.

The law also defines the leaders of the innovative activity and the ministry in charge of the innovative activity.

The subjects of the national innovation system are: universities, scientific and institutes for research and development, educational institutions, scientific-research laboratories,
companies for transfer of technologies and innovations, centre for research and development, innovation centres, business-technological incubators, technological parks, professional groups and associations, financial organizations and other legal and natural persons interested participating in the system.

The subjects of the national innovation system may include also institutes, stock exchanges, funds and information networks or legal persons established for the purposes of providing services in the sphere of the innovation system.

The private and public sector are equal in the establishment, management or funding the subjects of the national innovation system.

Specific provisions of this law define the Committee for monitoring the development and commercial exploitation of innovations, as an expert body in charge of preparation of the analysis on the status of the innovative activity, comparison with international standards and initiation of adoption of relevant laws, regulations and provisions in this sphere, in order to stimulate the innovative activity.

The Registry of innovative activity is defined in view of recognizing and registration of the innovative human resources and infrastructural potential, as well as projects and the achieved results. The records kept in the Registry provide the data on spatial distribution of the innovation potential in the Republic of Serbia, prevent doubling the capacities and projects and which is the most important, enables easy monitoring of a degree of progress in this field.

All the categories defined by this law have been registered within the Registry, which is a precondition for participation in the projects funded from the budget. Highly-technological and medium-technological companies are separately kept in the Registry and their status has been defined by the provisions of this law in proportion to the level of investment in research and development.
Organizational units prescribed by Law on innovative activity

The scientific, research and innovation potentials were concentrated in big centres during previous decades which resulted in a form of their “alienation” from resolving of actual problems in industry both in local and regional development. In that way this type of the activity could be successfully implemented only in universities, faculties and institutes. This resulted in leaving certain regions without human resources that could be drivers of their development and infrastructural facilities that had been used in the past were materially neglected, as well as in terms of human resources. At the same time, young people who wanted to engage in this activity couldn't satisfy their elementary existential needs in big cities, this resulting in a decreased quality of their work due to constant battle for survival. All this contributed to a reduced attractiveness of scientific-research and innovative work in Serbia to young people, already creating serious consequences for the whole society.

In order to change this scientific-research and innovation potential should be dispersed throughout the whole territory of Serbia as much as possible, engage it in the total development of the country, along with making connections both at regional and local level, at the same time using all communication and information tools in order to preserve the quantity of a certain branch and perform the centralization of the whole quantum of knowledge.

The Law on innovative activity establishes a series of organizational and infrastructural forms whose main activity is scientific research and innovative activity serving to economic, regional and local development. Along with the existing organizations such as faculties and institutes, a special stimulation is given to the establishment of innovative organization in the form of:
- development-production centres
- scientific-development centres and
- Innovation centres

In this way, the conditions for associating individuals with necessary qualifications and programs into smaller organizational units have been established, enabling the performance of scientific, research-development and innovation work. Their specific advantage is that they
could be “recognized” in the competent ministry irrespective of the size of the organizational unit and that they could compete for certain projects funded from budgeted funds.

Development-productive centre is the innovative organization established for the purpose of conducting research, development, creation, application and placement of innovations produced by own inventive work. This creates the opportunity to perform the production and placement of one’s own innovation at the market along with the research work. We may find lots of examples in practice that certain innovations created within the existing scientific-research organizations can hardly be realized in the end and placed at the market. In this way there is a possibility that certain innovative products created at faculties, institutes or within a certain group could be produced and improved in development-production centers whose owners and founders are the institutions employing the authors of solutions. This shortens the time since the creation of the innovation until its placement at the market which is of utmost importance for the competitiveness of the innovation.

Research-development centre is the innovative organization in which applied and development researches are conducted, innovations created and knowledge and technologies used in own production or in the production and services of other economic operators. This is an organizational form that offers the possibility to conduct scientific and development researches in specific scientific and economic spheres significant, in the first place, for certain companies, regions and local government. There is also a possibility to have production within a research-development centre, in order to reduce the necessary time from the creation to the realization of innovation.

Innovation centre is the innovative organization in which its own results and the scientific results of other institutions are applied in the original and systematic manner, as well as modern technological processes for the purpose of creating innovations, developing prototypes, new products, processes and services and in which transfer of knowledge and technologies is made to other economic operators’ production, in a certain sphere. This organizational form should in the first place serve to providing professional and vocational training to young experts in the form of post-graduate and doctoral studies for their future individual scientific, research-development and innovative work.
This results in the establishment of conditions that individuals, companies, regions and local governments establish their own organizational forms that may conduct scientific, research-development and innovative activity, and by which a double effect is created. On one hand it enables a dispersion of a scientific, research and innovation potential at the whole territory of the country while they are located at the very source and may get information where and how to use their own potentials and resources, and on the other hand the acquired knowledge can be applied in view of increasing productivity and competitiveness. This contributes to the economy becoming closer to research-development and innovative potentials, all in view of increasing the total competitiveness of the Serbian society.

A very important effect of such approach in the Law is in the fact that by enabling local government units and regions to establish their own innovation organization there are more opportunities for the return of young educated professionals to their home environment, while they could still advance in their professional and scientific work, which was not the case in the past.

When defining such legal provisions, the objective was that each local government in Serbia should have at least one research-development centre that must employ a certain number of persons with high professional qualifications.

A local government should allocate around 70,000 euro at the annual level for employees’ salaries so that a research-development centre could function, which is in accordance with the conditions applied at this moment in the ministry in charge of scientific issues, while the total annual amount together with necessary overhead costs does not exceed the amount of 100,000 euro per local government.

In this way and in accordance with legal provisions, each local government is offered a chance to establish the conditions for a powerful development of own scientific-research and innovative potential by organizing their own research-development centers, particularly using already existing infrastructural facilities each local government disposes of, as well as by connecting with local industry subjects for purchasing or joint use of the existing equipment and material funds, while providing the space for the return and stay of young and educated professionals.
In order to achieve this, it is necessary that local leaders should identify all benefits offered in this way, but they should also be capable of doing all this, which was not the case so far, thus the Registry of innovative organizations records no innovative organization whose owner and founder is a local government.

In order to connect the economy with the scientific, research-development and innovation sector as fast as possible, the law defines the organizations for providing infrastructural support to research-development and innovative activities in the form of business-technical incubator and scientific-technological park, organizations for stimulating innovative activities in the priority sphere of science and technology and the centre for technology transfer.

A business-technical incubator is defined in the Law as a company making available for use, against a consideration, the business premises, administrative, technical and other services to newly-founded companies or innovative organizations, for duration of five years as of their establishment at most, in this way ensuring that the start of their business activity should not be oppressed with great investments in infrastructure, so that all necessary funds could be focused on the innovative and productive activity for the purpose of a faster placement of new products and services at the market. The limitation of a potential stay of service users in a business-technical incubator helps them become quickly and fully independent, leaving the space for other companies and innovative organizations at the start of their business activities.

Scientific-technological park is the most frequent organizational form in developed countries used for making immediate connections between science and industry in view of creating innovations and increasing overall competitiveness. In order to make the scientific-technological park functional its connection with the university, companies and local government units should be provided, while these can be founders and users of services at the same time as members. Legal provisions prescribe that scientific-technological park is a company providing infrastructural and professional services to university, scientific-research and innovative organizations within its space, as well as to highly-technological and medium-technological companies in a certain scientific, research-development or production group, in
view of connecting them and for the purpose of a faster application of new technologies, production and placement of new products and services in the market.

Organization for stimulation of innovative activities in the priority sphere of science and technology is an enterprise established exclusively for the purpose of stimulating innovative activities in priority spheres of science and technology under a specified strategic document.

Centre for technology transfer is an enterprise established exclusively for the purpose of performing the transfer of technologies and applying technological innovations which includes a search for ideas and partners for technology transfer, assessment of commercial potential of transfer, stimulation for realization and commercialization of technology transfer and support in the protection of intellectual property to technological companies developing products and selling innovative products, processes and services with a high level of know-how and new technologies.

**Innovation activity programs**

In order to stimulate innovative activities, create innovative products and services in accordance with the provisions of this law, the Government adopts innovative activity programs for a current budget year upon the motion of the relevant ministry.

The programs are realized through innovative and development projects.

Enterprises, universities, scientific-research and innovative organizations may be leaders of innovative and development projects, in accordance with the law.

By rule, innovation projects last up to one, while development programs last up to two years.

In case several organizations implement one project, they appoint a project leader by mutual agreement.
Review of the Innovation Process and the Corresponding Funding Possibilities in Serbia

Intellectual property rights acquired during the implementation of innovative projects and mutual relations of participants are subject to the provisions of this law from the aspect of subsequent financial effects that may be created by the implementation of innovations at the market.

Intellectual property (invention, industrial design, topography of integrated circuits) created during the implementation of the innovative and development project funded by the budgeted funds of the Republic of Serbia shall belong to the organization in which such intellectual property was created.

The organization shall be entitled to patent protection (right to get patent and small patent), industrial design protection and protection of the integrated circuits topography.

Inventor, author of design and the author of integrated circuit topography shall be entitled to be indicated in that capacity in the patent application, small patent application, industrial design application and integrated circuit topography application, as well as in documents, registers, files and other publications.

If a patent or a small patent has been commercially exploited, the inventor shall be entitled to a consideration in the amount of at least 50% of profit the organization has generated by exploiting such patent, and/or small patent respectively.

If there are several participants in the project, and/or if there are several inventors, the share in profit shall be determined in proportion to their individual contribution to the creation of the invention.

A leader in the implementation of the innovative activity and person appointed for a leader of the project funded by the funds from the budget of the Republic of Serbia shall take measures to identify potential novelty made by the product and procedures conducted during the implementation of the project in comparison to the existing technology condition and in case of positive findings, they shall be responsible to ensure that such products or procedures should be patent protected or small patent protected in the Republic of Serbia.
Innovative activity funding

In order to enable resolving as much actual requests as possible made by industry and society in general, legal provisions prescribe that the funding of the innovative activity may be made from the budget of the Republic of Serbia to local government level, from international funding sources, by different incentive measures and funds. It is very significant to point out that local governments are offered the opportunity to plan the funds within their budgets intended for innovative activities conducted at their territories, in view of resolving their actual problems and establishing their own technological niches, as well as identifying their comparative advantages. By allocating their own funds and stimulating the innovative activity at local level, there arises the competitiveness among local governments themselves in terms of attracting quality personnel and faster achievement of international standards in certain spheres of economic and social life, as well as increasing overall standards at the country level.

In particular, the Law prescribes funding the innovative activity through the Fund for innovative activity.

Fund for innovative activity – In order to provide financial resources for stimulating innovativeness, this Law establishes the Fund for innovative activity (hereinafter referred to as: the Fund) as a legal person owned by the state and with a seat in Belgrade and registered within the business registers agency. The Fund performs the activities in relation to funding the preparation, implementation and development of programs, projects and other activities in the sphere of a national innovation policy, and in particular professional activities in relation to collecting the Fund’s resources, their management and utilization, mediation in relation to other sources of funding and stimulating the cooperation with them.

The Fund’s resources may be used for funding innovative activities, in particular:
1. for the implementation and placement of innovations;
2. for stimulating innovative activities among the youth;
3. for stimulating innovators to use local resources;
4. for stimulating innovativeness in view of ensuring a sustainable development of rural areas;
5. for stimulating innovativeness in view of ensuring the overall sustainable economic development;
6. for improving information systems on the condition and results in the sphere of innovative activities and
7. for stimulating and co-financing the presentation of results at local and international events;

In view of ensuring as wide financial basis for stimulating innovative activity as possible, it has been prescribed that the autonomous province, a local government unit, and/or one or two local government units may establish the fund for innovative activity to be funded from income generated at their territories. All terms and conditions related to the Fund for innovative activity will be applied to these funds, as well.

**Economic incentives** – This law particularly underlines the significance of the adoption of economic incentives for legal and natural persons applying modern technologies, creating and circulating innovative products and services, implementing patent solutions or financially supporting a development of the innovative activity. The Ministry may give consent for determining tax, customs and other relieves or exemptions from payment obligations, under the conditions and in the manner prescribed by the law. Also, the law prescribes the possibility of determining special incentives in the form of subsidies, deposits and their reimbursement for companies and entrepreneurs investing in development and increasing the level of innovativeness and inventorship, under the conditions and in the manner prescribed by the law.

**Annual report on the innovative activity**

In view of quantification and identification of own position in comparison to other countries, all developed countries prepare the annual report on the results and status of innovative activities in their territories. This Law prescribes that such a report should be prepared in the Republic of Serbia as well. In order to obtain appropriate and as precise data as possible, a legal obligation has been defined for the autonomous province and a local government unit to file the annual report to the Ministry at the end of a calendar year on the results and status of
innovative activities in their territories, as well as on the consumption of their budgeted funds for that purpose. The data obtained in such a manner become an integral part of the total annual report on the condition of the innovative activity in the Republic of Serbia. The Minister prescribes the contents of annual reports for the purpose of ensuring a uniform approach and presentation of data.

As a supplement to the law, the relevant minister prescribes implementing provisions by which certain provisions are supplemented by instructions under which procedures should be conducted, by forms, registries and other acts so that the law should be fully implemented. All such acts may be found at the site of the Ministry of Science and Technological Development, www.nauka.gov.rs.
5. National and international financial support to innovation in Serbia

There were no real initiatives during previous decades with respect to measures that would be oriented towards innovative, i.e., small and medium enterprises with a high rate of growth in Serbia. It is the result of the existence of social ownership as the basic form of ownership in Serbia, and it was only after 2000 that state and private ownership were valued on the equal basis and the term of social ownership completely disappeared as an economic category.

The real turning point in the method of funding innovative activity occurred after the adoption of the Law on innovative activity in 2005 that stipulated the establishment of the Fund for innovative activity and also enabled other forms of institutional and private support to the creation and development of innovations.

This was followed by actual and very positive support initiatives that were directed to innovations such as the establishment of incubators, innovation centers, national competition for the best technological innovation, financial support to innovation projects, etc.

However, certain significant problems remained related to, in the first place, lack of coordination of all those initiatives, insufficiently developed cooperation between research institutions and business operators, as well as to non-existence of the appropriate sources of funding. Even in situations when certain amount of capital had been provided, there was no adequate control of the achieved results in accordance with the funds consumed, thus the mechanism of actual support to the innovative activity as a routine practice and motor power of the development of a society was not established.

Irrespective of the fact that it could have been better, a progress was made during the past several years in the development of measures of support to potential innovative entrepreneurs and founders of innovative companies through the network of regional agencies and offices of the Republic agency for SMEs and entrepreneurship development, as well as the Serbian Chamber of Commerce in the sphere of training of owners of SMEs and potential innovative entrepreneurs.
By 2008, over 150 projects were implemented in Serbia through different forms of cooperation, and most of such projects were funded by the European Agency for Reconstruction and related to providing consultancy and instructions on procedures for company registration, legal issues and manners how to provide support in the sphere of business planning and obtaining micro-financial funds.\(^{(37)}\)

However, the consultancy services in the sphere of intellectual property rights protection, innovation improvement and innovativeness, as well as defining the strategy of internationalization and making business connections were available to a very limited degree.\(^{(38)}\)

Some of those projects that were directly related to the development of the innovative entrepreneurship and increasing the level of competitiveness were presented in the following list:

**CARDS 2004 - €4.5 million- Enterprise Development and Entrepreneurship programme** with the objectives to: (i) strengthen the institutional framework for policy development and implementation including support to implementation of the national SME strategy and the European Charter for Small Enterprises; (ii) improve the capacity and effectiveness of the SME support structures – the national network of regional enterprise support centers and regional development agencies - to provide quality business development services including self employment; (iii) develop a national innovation strategy; and (iv) support establishment of an enterprise development and innovation grant fund.

**CARDS 2004 - €4.5 million** – reinforce the institutional framework for investment promotion, promote Serbia as a highly competitive investment location, stimulate an increase in the supply of ‘green field’ property options and enable Serbian firms, particularly SMEs, to become approved suppliers of foreign investors.
CARDs 2005 - €2.5 million - restructuring and development of 40 SMEs and foreseen training to between 150-180 SMEs implemented through EBRD TAM

CARDs 2006 - €4.0 million – enterprise competitiveness: support restructuring and development of a minimum of 72 SMEs in priority sectors, enterprises with environmental and energy efficiency concerns, enterprises owned/run by women entrepreneurs, and young high-tech enterprises; and training to 100+ SMEs, implemented through EBRD TAM.

The basic problem that used to occur in Serbia was that the projects lasted while the funds from international sources lasted and they were not implemented "in the field" in the right way. It was obvious that local partners showed interest while the funding lasted, but they showed no interest in the actual take over of knowledge and implementation of best practices that would continue in future. At the same time it happened that foreign consultants conducted the planned activities and solely with the wish to generate their own financial benefit, and not to provide the actual contribution to the change of manner of work and dealing in many sectors.

A good example of the excellent approach of foreign experts and a very negligent approach of local partners to the realization of the project is the case of the construction of business incubators in Nis that were donated with the significant funds by the Government of Norway, and the fact that they do not function at this moment. More such examples may be found and they represent a confirmation that certain projects were often imposed to a certain environment and that it was not ready to absorb it in the best way, thus there was no necessary synergy of different projects that would jointly give a better result and that would have continuity in implementation.

With respect to funding the development of innovations and providing initial funds for their realization, there are several potential sources in international practice, usually as follows:
- innovators’ own funds or funds supported by “business angels”
- Development funds / Donations
- Risk Capital Funds
- Commercial Banks
- Investment funds and securities market
Let’s consider the basic characteristics of each of them and the current situation in Serbia:

*Innovators, family, “business angels”*. During the initial phase of creating an innovation or at the later stage of an innovative company, the greatest part of financial funds comes from the savings of innovators themselves/entrepreneurs and from their close family members or cousins. In EU countries, as well as in the USA, there is a category of the so-called “business angels” that are often the sources of initial financial funds. These are mostly rich investors-entrepreneurs or rich retired entrepreneurs interested for close cooperation with innovators in need of financial funds and who wish to constantly contribute to the creation of new ideas and products in the first place and then to increase their capital. Because of that they both provide certain financial funds and often their professional skills and knowledge, being aware of the fact that both the investment levels and risks are high. In order to establish as efficient environment for the development of innovations as possible, governments of certain countries strongly support the establishment of networks of “business angels”, as well. Such measures increase the level of information available to “business angels” on different investment potentials, and on the other hand they enable innovative entrepreneurs access to as many "business angels" as possible. Further, “angels” and innovators that correspond to each other are more efficiently found with such networks. By providing their managerial experience, “business angles” increase the probability that the innovation will be realized and that a new company will survive.

With respect to Serbia, practice to date shows that the greatest part of innovations has been developed on the basis of own innovators’ funds. The networks of “business angels” do not exist at this moment in Serbia thus such model has not been established, but there are certain and successful individual cases, associating of innovators with individual owners of capital for the purposes of developing innovations.

*Development funds*. These funds may be established by governments, non-government organizations and other institutions so that they could financially support further development of companies in cases when such companies are not in the position to access commercial funds. Most governments in the EU have established such type of funds in order to reduce the total level of risk that is very high on a regular basis through as many investments in different
innovation projects as possible. The granted funds may and may not be refundable which depends on a case. The most popular instrument among innovators for providing a direct financial support to the realization of innovations is a donation. It usually covers a certain level of costs of the realization of the innovation, but donors by rule have no such an active role as “business angels” have. Reasons for granting donations may be numerous and differ from country to country. Donations may be granted both by individuals and countries, either from human, political or economic reasons when with the initial donation they can subsequently enter a certain economic space. SMEs, as well as public institutions such as universities and research centers are the biggest users of donations within the European Union. Also, by using certain funds’ resources it is possible to provide certain subsidies with the aim to provide support and stimulation to cooperation, knowledge transfer and technical development of a certain branch or group, abut they are rarer, at least declaratively, due to new rules introduced at the EU level and at member state level, and for which the countries candidates for membership such as Serbia at this moment should prepare.

This type of funding innovations through development funds, donations and subsidies has been established in Serbia after the adoption of the Law on innovative activity that enabled funding the development of innovations of innovators registered within the Registry of innovative activity through innovation projects, figure 5.1. These funds are not great, they are planned in the budget of the Ministry of Science and Technological Development, but they are non-refundable and serve as an incentive to innovators, in the amount up to 10,000 euro per one project.

The next possibility within this group available to innovators in Serbia are the funds of the Serbian Development Fund. The criteria for winning these funds are very strict and the Fund takes over no responsibility regarding the realization of innovations by introducing the category of mortgage on innovator’s property if the innovation has not been realized to a degree it is possible to return the obtained funds. In this manner such funds obtained the character of a classic bank loan of commercial banks, but the annual interest rate is 1% and there is one-year grace period to the repayment of the loan. The practice to date showed that innovators and innovative small and medium enterprises hardly decide to take these funds. Instead they are used by those who want to expand the capacities of the current production process, buy new equipment or construct additional facilities.
Further, similar to this there is a possibility for innovators in Serbia to use budgeted funds that are invested through the Ministry of Economy similar to loans, in view to support entrepreneurs, start-up companies and innovators. The total summary of invested funds in 2008 for this purpose is shown in Table 5.1. Although the funds are not negligible, there are no clear criteria for obtaining such funds, and at the same time there is no feedback on the achieved results on their investments, i.e., on how many innovations have been created on the basis of such funds, what their geographic distribution is and what profit was made by their realization that may be used as a start-up capital for new innovative entrepreneurs.

**Table 5.1**: Realized support to SMEs from the RS Budget in 2008 (40)

<table>
<thead>
<tr>
<th>Institution</th>
<th>2008 (RSD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Start-up loans</td>
<td>3.270.973.000,00</td>
</tr>
<tr>
<td>2. Loans for development of enterprises and entrepreneurship in underdeveloped municipalities</td>
<td>2.060.500.000,00</td>
</tr>
<tr>
<td>3. Loans for stimulating the quality of tourist offer of natural persons, SMEs in the sphere of tourism</td>
<td>393.520.000,00</td>
</tr>
<tr>
<td>4. Serbia Investment and Export Promotion Agency (SIEPA)</td>
<td>54.380.774,52</td>
</tr>
<tr>
<td>5. Ministry of Economy and Regional Development (clusters, business incubators)</td>
<td>69.931.145,80</td>
</tr>
<tr>
<td>6. National Employment Service (included active measures of employment policy (public works included as well)</td>
<td>2.501.966,247,94</td>
</tr>
</tbody>
</table>
The amount of more than 200 million Euros is not small for Serbian economy, and with the repayment term of about 5 years the fund of almost 50 million Euros could be established and invested with a higher level of risk, but with a greater potential income, for developing new innovations in Serbia. In this way, the core for establishing the fund of risk capital can be made, but legal conditions have not been in place yet. A special problem exists in the lack of horizontal connection between ministries in the Government of the Republic of Serbia and at this moment it is not possible that such funds could be allocated to the Fund for innovative activity and that they could be invested again through the established controlling instruments and criteria for selecting quality innovations in the Ministry of Science and Technological Development this time for the realization of innovations with a higher risk of realization. However, this could be established by the mechanism of support to innovative activity.

This group of potential sources for funding innovators includes also the winning of grants for developing innovations through participating in the Competition for the best technological innovation in Serbia. It takes place for the sixth time in Serbia at this moment, organized by the Ministry of Science and Technological Development, Serbian Chamber of Commerce, Faculty of Technical Sciences Novi Sad and the National Public Information Service (RTS). It offers the possibility to all innovators from Serbia, and as of 2007 to innovators from the Republic of Srpska, to establish the team of at least three members engaged in the realization of innovation and win a certain position and certain pecuniary awards. The applications are filed online at the site www.inovacija.org and all communication is made through Internet, which on the other hand enables the participation of a great number of Serbian experts who live and work all around the world in the assessment of the filed innovations. Apart from pecuniary awards that may be obtained on the basis of ranking in the competition, all participants will obtain a significant non-financial support by means of one-year training during the competition cycles on how to transform the idea into innovation, how to verify the
innovation by a business plan and how to place it and protect it at the market. In particular, successful participants will have a significant media support either through participation in final manifestations that are broadcasted at the national television channels, or through numerous broadcasts on national and local radio and TV channels. The number of teams, the number of prepared business plans, as well as the award fund in the past five years has been shown in Figure 5.2.

![Figure 5.2 Data and budget of Competition for the best technological innovation in Serbia](image)

*Risk Capital Funds.* A specialized form of funding innovators or enterprises in the early stage of development, and/or their business ventures based on technology or innovations is implemented through risk capital funds. These funds’ resources are usually invested in innovative companies with a great potential for growth, but they are selected from numerous potential candidates. The funding is usually made for several projects with a high risk of success, but at the same time the profit in case of success is greater than funding any classical investment. In order to identify this potential, lots of risk capital funds employ specialized managers who make a selection out of potential projects subject to funding and mostly within the total number of projects that wish to obtain the resources from risk capital funds, and who
select only a few percent of projects subject to funding. Usually, these funds participate with the part of ownership in innovation to multiply return the invested money and cover the part of costs incurred on unsuccessfully assessed projects if the innovation has been successfully developed. The level of investment is medium to high, while the risk is very high.

Innovations are funded through risk capital funds, and risk capital investments relate to the investments of share capital in private companies in the development phase. Risk capital funds provide share capital to enterprises that are not listed at stock exchange. Private capital may be used for developing new products and technologies for increasing the working capital, for acquisitions or supporting the balances of an innovative company. Private capital may also be used to clarify the issues of ownership and management in companies owned by one family, while experienced managers may use the private capital for acquisition or sale of a certain enterprise.

There are no classical risk capital funds in Serbia. During 2006, the amount of 2.5 million euro was allocated from the funds of the National Investment Plan (NIP) to fund the participants in the Competition for the best technological innovation. Although the sum was not so large it was very useful for establishing the initial mechanism of funding innovators, the Law on innovative activity established the Fund for Innovative Activity in accordance with the principle of best practice of risk capital funds all over the world. There were no established legal conditions in Serbia at the time, thus the funds for innovators had to be found indirectly. However, after one of coalition partners left the Government and new parliament elections had been published, it was impossible to establish one system that could fully reflect the system of support to innovators through risk capital funds' resources in the developed countries in the world.

One of the funds that tried to function as a risk capital fund privately owned and with a seat in Belgrade, but registered in accordance with the Swiss law was the Investment Fund “Orah”, established in 1999 in Serbia and funded by foreign investors’ capital. “Orah” offered the shares at the price of 80 USD to attract small investors in Serbia but it could not collect enough money to make a rich portfolio. At this moment, “Orah” owns the ICTT business incubator in Genex building. This investment fund provides the funding for companies having
information technologies as the basic element of business concept, through the business incubator.

At one moment after 2005, “Orah” tried to gather donors (IFC, EBRD), government institutions and private sector institutions (insurance companies) in one place in order to establish the efficient fund for funding innovative companies, but unsuccessfully since the required amount of local participation of 2.000.000 euro could not be provided.

Other active risk capital funds in Serbia have been funded through donations as of 2000, and they have been focused on the whole region, for example, Copernicus Fond (financed through EBRD, IFC and private partners’ funds) and the South-East Europe Capital Investments Fund (funded by OPIC and Soros Foundation). These funds are oriented to affirmation and bigger companies. Both of them have holding companies in Serbia.

As the banks specifically oriented to the development of private sector, KfW and DEG had planned to participate in the private capital fund SEAF in order to initiate their operations in Serbia, but there was no actual realization that would be recognized by innovators in Serbia.

Commercial banks. In most countries the banking sector is divided into “corporate banks” that are focused on big corporate companies and “banks for small enterprises” focused on the innovative SMEs. Microfinance banks grant loans to micro-companies (with less than 10 employees). Commercial banks provide share or risk capital only for a certain number of innovative companies at its sole discretion and the main products of commercial banks are granted loans. Innovators decide to use these funds in the phase of final realization of the innovation when all indicators point to a comparatively low risk of use of usually expensive loans.

Commercial banks with business operations at the territory of Serbia have not shown interest in funding the innovative activity so far, while a development bank did not exist at all. The Development Bank of Vojvodina is of a recent date and its funds may be used by the innovators from the territory of the autonomous province of Vojvodina, but comparatively high interest rates to granted funds are still a problem. As we have already explained, the Serbian Development Fund was established to stimulate the economic development in
underdeveloped regions, to support the development of small and medium enterprises and a
development of new technologies (and to support export oriented companies). In most cases
the Fund grants loans through commercial banks and this has caused certain problems for loan
users since commercial banks have a certain number of requirements to secure loan
repayment, therefore innovators whose innovations bear a high degree of risk of realization
almost do not apply for such funds.

*Investment funds and securities market.* In the case when the companies are listed well at the a
stock exchange, they can decide to be funded from investment funds or to be registered at the
securities market, and this is usually done while developing a certain innovation within
already developed production program. Investment funds usually take only a minor share in
innovative companies and the investment level is low to medium. However, the securities
market is interesting for bigger companies in the first place, thus such type of funding is rare
for innovators and innovative SMEs.

The share capital has not been established as a scheme under which innovators in Serbia could
be funded, thus such funds are not used for developing innovative activities.

Amendments to the Law on innovative activity adopted this year enabled the establishment of
Organizations for stimulating innovative activities in the priority sphere of science and
technology as enterprises for the purposes of stimulating innovative activities in the sphere of
science and technology determined by a strategic document, apart from the existence of the
Fund for innovative activity that has not started to function yet. This is actually the space in
which private capital may participate in funding the innovative activities, but there are no
practical examples yet to verify the correctness of such a solution.

Irrespective of new solutions, at this moment the innovators in Serbia are forced to be funded
from personal funds, to cooperate with a certain individual “business angel” or get budget
funds under the projects of the Ministry of Science and Technological Development, and/or
Ministry of Economy or Regional Development.

In order to support the innovative activity it is necessary that a series of regulations should be
adopted to stimulate non-financial support and tax relief for those investing in the R&D and
innovative activities, which has not been done yet, and there is no recognized project of the Government of Serbia at this moment that would lead in that direction.

In order for the Serbian economy to move forward, serious improvements in the investment environment in Serbia are of the greatest significance, and particularly in the sphere of investments in the innovative activities. Currently, there is a wide range of institutional and practical restrictions for investments, from the role of the banking system to poorly developed market mechanisms for capital and other forms of investments.

More significant and more visible improvements in the availability of financial funds can be made if the following necessary changes are made to the investment environment, so that:

- Legal solutions truly and practically stimulate the establishment and operation of companies and risk capital funds.
- There is a network of companies and risk capital funds.
- There are actual sources of financial funds for risk capital.
- The databases with the presented investment potentials could be available.
- There is a network of SMEs trained to become “ready for investors”.

In order to efficiently implement any changes in the Serbian society, it is necessary that the Government of Serbia should be fully involved, as well as other subjects that may contribute to such changes.

In that respect it is necessary that the following should be done:

1. The Ministry of Finance should be far more involved in the creation of all elements and conditions to prepare the framework for funding innovations;

2. The Government of the Republic of Serbia must take over a part of the risk by securing different funding sources that are ready to invest in innovations;
3. At least one fund should be established, with private and state capital, that would operate under the mechanism of a risk capital fund as an example and encouragement for other Serbian citizens;

4. Procedures and conditions for winning the funds for development of innovations should be simplified and made available;

5. The measures of indirect funding should be implemented, including tax relieves for company’s investments in research and development;

6. Universities in Serbia should be encouraged to promote and realize entrepreneurship among highly educated personnel and increase cooperation with industry and local government with regard to resolving actual problems, with the provision of financial funds for such joint ventures;

7. Establish the market for funding new business ventures;

8. Encourage and stimulate by tax relieves those who wish to invest in the innovation development in Serbia.

Funding innovations in Serbia is a key parameter for measuring the speed of Serbian transition process. At this moment it is significantly reduced, but the potential in Serbia still exists and it should be encouraged and organized in the appropriate manner.
6. Main national and European web based sources of information on innovation

Innovators in Serbia may collect information from more web addresses, either on legal provisions, sources of information, organization, projects, as well as EU decisions in the sphere of innovations and examples of best practice in organizing and stimulating innovative activities, respectively.

The Ministry of Science and Technological Development is in charge of the issues of innovations in Serbia, with the web address www.nauka.gov.rs.

Innovators may download all information on legal and implementing provisions relating to the innovative activity from this address. All the documents, requirements and forms necessary for applying for registration within the Registry of innovative activity may be found within this site. Along with this information, this site also publishes public invitations for participation in innovative projects and allocation of financial funds for infrastructural furnishing of innovative organizations, in accordance with the law. Also, this site may be used for obtaining necessary information about the participation in international projects in which the ministry takes part, such as in EURECA, FP6 or FP7 projects. Since the Ministry of Science and Technological Development is in charge of organizing the Competition for the best technological innovation in Serbia, the link for that competition may also be found at the same web address.

Innovators in Serbia may obtain financial resources also within the activity of the Ministry of economy and regional development, with the web address www.merr.gov.rs.

This ministry is organized as one of the most important ministries in the Government of the Republic of Serbia, since its activity covers a wide range of companies from micro to big companies, as well as regional development, and connecting and introducing local governments in development projects. The manner of organizing and registration of small and medium enterprises, as a precondition for obtaining the status of innovation organization in the Registry has been prescribed by legal provisions under the competence of this ministry,
within the Sector for small and medium enterprises. Since this ministry disposes of incomparably greater financial resources than the Ministry of Science and Technological Development, certain funds that may be significant for innovators and development of innovative activity are allocated to one aspect of the activity, thus all information regarding the conditions and competing for such funds may be found at this site. A big number of international projects in which the Republic of Serbia participates are implemented through this ministry, therefore this web address is one of the most important ones for innovators in Serbia.

Within its activity, the Serbian Development Fund has also allocated certain funds for innovation activity but the funds have been restricted by very strict criteria as described in Chapter 5, therefore the innovators can visit the site www.fondzarazvoj.gov.rs.

The funded programs, as well as conditions under which funding will be conducted, patterns and forms necessary for applying for any of such programs and all necessary information have been defined in this site. The Development Fund’s funds may be used exclusively by private companies in Serbia, so innovators may be in advantage if they decide to accept the Fund’s conditions.

The Agency for small and medium enterprises was established within the Government of the Republic of Serbia and it was subsequently transformed into the Agency for Regional Development, with the address www.narr.gov.rs. In practice to-date, neither former Agency for small and medium enterprises, nor the present Agency for Regional Development has stimulated the innovative activity in Serbia to a sufficient degree and had no specific programs and projects or participated in the projects governed by the ministry in charge of the scientific issues. Anyhow, innovators have usually been organized within the sector for small and medium enterprises, and this is definitely the web address that the innovators in Serbia should include in their address books.

In order to stimulate greater foreign investments in the Serbian economy and at the same time enable export oriented projects to make positive results in foreign markets as easy as possible, the Government of the Republic of Serbia has established the Serbia Investment and Export Promotion Agency (SIEPA), with the web address www.siepa.gov.rs. Since its
establishment, this agency has had a continuous insight in the condition and innovative activities in Serbia, but true connections with innovators and realized innovations that could have been placed in foreign markets have not been realized probably due to frequent personnel changes in the Agency's management.

The Ministry of Labour and Social Policy covering the employment sphere deals with the innovations in social sphere within its activities, thus innovators may find the link [www.inkluzija.gov.rs](http://www.inkluzija.gov.rs) that contains all necessary information in this sphere at the web page [www.minrzs.gov.rs](http://www.minrzs.gov.rs).

As the organization gathering all businessmen in Serbia, the Serbian Chamber of Commerce (SCC) provides a full support to the development of innovations in Serbia through the activities of its Committee for Technological Innovations, the information of which may be found at the site [www.pks.rs](http://www.pks.rs). In previous decades, the SCC has provided a strong support to the development of innovations, but it was only after the adoption of the Law on innovative activity that the SCC structurally defined its sector dealing exclusively with innovations. By providing the space for meetings, trainings, fairs and other manifestations, through its network of regional chambers of commerce, it represents a core place for gathering of innovators in Serbia at this moment.

The Competition for the best technological innovation has taken place in Serbia as of 2005, supported by the Government of the Republic of Serbia, Serbian Chamber of Commerce, National Public Service RTS (Serbian Radio and Television), along with the technical organization of the Faculty for Technical Sciences Novi Sad and all information on the competition may be found at the address [www.inovacija.org](http://www.inovacija.org). More than 5000 participants have taken part in this competition, providing more than 1500 innovative solutions. All the communication has been made through Internet making it a unique database of all innovations and innovators, no matter they have been entered into the Registry of innovative activity or not. The competition aims at spreading innovative culture in Serbia in the first place, raising innovative awareness and acquisition of all necessary knowledge as prerequisites for successful realization of innovations, to end with certain ranking and granting awards. At this moment this is the site that provides all necessary information to innovators in Serbia and as
such it is unique for a wider area of the Balkans, and as of 2007 it includes the innovators from the Republic of Srpska, as well.

Along with these sites, certain information, in the first place the information on the announced international competitions in which innovators may participate, may be found at different addresses in Serbian language.

As already indicated in Chapter 5, the banking sector with its operations in Serbia has not shown interest for developing innovative activities in its to-date’s practice, thus significant information for innovators may not be found at their web pages.

When speaking of foreign sites, the most important site is the site of the European Commission http://ec.europa.eu where the information on regulations in the sphere of innovative activity, organization, competitions for certain projects, manner of measuring the level of innovation, very useful analyses, certain databases, as well as many other data may be found.

Much information on the program “Competitiveness and Innovation Framework Programme (CIP)” specially intended for innovative SMEs may be found within this site at the address http://ec.europa.eu/cip.

A special part refers to the sector of entrepreneurship and innovation at the address http://ec.europa.eu/enterprise, while the information on innovations, regulations and manners of support to the development of innovative activity may be found in the special sub-sector http://ec.europa.eu/enterprise/policies/innovation.

The site http://www.oecd.org is a very important site for obtaining useful statistical information, with a special emphasis on innovativeness. Since the innovativeness has become a key word when speaking about technological development, this address contains lots of data on regulations, strategy preparation, as well as on statistic models that may be used for assessing the innovative potential. Lots of useful literary references relating to innovations are also available.
Along with the listed ones, the site dealing with promotion and development of innovative activity is the site http://www.innovationtools.com where the news, different strategies and articles on the development of innovative activity may be found.

Examples of best practice in certain countries may in particular serve to legislators, generators of funding and organization of innovative activity at the state and local level and such examples will only be listed here and without a detailed description of what each country needs for the establishment of the innovation system.

Some of the sites where examples of EU best practice may be found are as follows:

**Finland:**
Council for Scientific-Technological Policy of Finland (www.vn.fi/hallitus/tiedeneuvosto/en.jsp)
Finnish Agency for Technology and Innovation Funding, TEKES, www.tekes.fi

**Sweden:**

**Estonia:**
Estonian Council for Research and Development www.riigikantselei.ee
Enterprise Estonia www.eas.ee

**Belgium:**
Institute for Innovation Promotion through Science and Technology in Flanders, IWT, www.iwt.be

These are only a few of numerous web addresses relating to innovations and best practice examples. If one is in a quest of specific information or examples from a certain country, the requested addresses may be found by means of any Internet browser.
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