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LIST OF ABBREVIATIONS

AA	– Agricultural Academy
ARC Fund	– Applied Research and Communications Fund
BAS	– Bulgarian Academy of Sciences
BERD	– Business Expenditure on R&D
BNB	– Bulgarian National Bank
BPO	– Bulgarian Patent Office
BSMEPA	– Bulgarian Small and Medium Enterprises Promotion Agency
CIP	– Competitiveness and Innovation Programme
CIS	– Community Innovation Survey
COST	– European Cooperation in Science and Technology
CR	– Commercial Registry
CRM	– Customer Relationship Management
EAVTFISC	– Executive Agency for Variety Testing, Field Inspection and Seed Control
EB	– Eurobarometer
EBRD	– European Bank for Reconstruction and Development
EC	– European Commission
EEA	– European Economic Area
EIF	– European Investment Fund
ERA	– European Research Area
ERP	– Enterprise Resource Planning
EU	– European Union
FDI	– Foreign Direct Investment
FIEC	– European Construction Industry Federation
FP	– Framework Programme (for Research, Technological Development and Demonstration)
GDP	– Gross Domestic Product
GERD	– Gross Expenditure on Research and Development
GVA	– Gross Value Added
ICT	– Information and Communication Technologies
INA	– Survey of Innovation Activity of Bulgarian Business conducted by the Applied Research and Communications Fund
IP	– Intellectual Property
IPC	– International Patent Classification
IT	– Information Technologies
JEREMIE	– Joint European Resources for Micro to Medium Enterprises
JSC	– Joint-Stock Company
LAN	– Local Area Network
LLC	– Limited Liability Company
MEET	– Ministry of Economy, Energy and Tourism
MEYS	– Ministry of Education, Youth and Science
NACE	– Statistical Classification of Economic Activities in the European Community
NEC	– National Electricity Company
NGO	– Non-Governmental Organisation
NIF	– National Innovation Fund
NRA	– National Revenue Agency
NSF	– National Science Fund
NSI	– National Statistical Institute
NSSI	– National Social Security Institute
NUTS	– Nomenclature of Territorial Units for Statistics
OECD	– Organisation for Economic Cooperation and Development
OP	– Operational Programme
R&D	– Research and Development
RES	– Renewable Energy Sources
SCI	– Science Citation Index
SITC	– Standard International Trade Classification
SMEs	– Small and Medium-Sized Enterprises
SMJSC	– Single Member Joint Stock Company
SMLLC	– Single Member Limited Liability Company
ST	– Sole Trader
SU	– Sofia University
UMIS	– Unified Information System for Management and Monitoring of the Structural Instruments of the EU in Bulgaria
VAT	– Value Added Tax

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EXECUTIVE SUMMARY

National Innovation Policy

Bulgaria's membership in the European Union necessitates the introduction of more complex horizontal policies in support of economic growth in order for productivity and incomes of the population to catch up more quickly with the European average. However, **there is still a lack of comprehensive public policy aimed at fostering economic growth based on knowledge and innovation**.

The 2004 Innovation Strategy of the Republic of Bulgaria is outdated and does not reflect the changes in the foreign and domestic political and economic environment related to Bulgaria's accession to the EU, the implementation of the financial framework on the absorption of the EU Cohesion and Structural Funds for the 2007 – 2013 programming period and the consequences of the financial and economic crisis in 2009 – 2010. These omissions have been overcome to a certain degree by the inclusion of elements of innovation policy in the National Scientific Research Strategy 2020 adopted by the Council of Ministers in June 2011. The experience from the application of the innovation strategy shows that **the lack of statutory institutional mechanisms** to ensure the implementation, the evaluation and the updating of the country's innovation policy **is still a fundamental drawback of the national innovation system**:

- Government support for innovative development of the economy is not transparent and sustainable;
- There is little connection between the various strategic documents related to innovation policy;
- There are no mechanisms for coordination of and reporting on the applied instruments from the various strategies;
- There is no actual financial support of declared policy choices reflected in the three-year budget forecast and the annual budgets.

Export-oriented innovative enterprises have a key role in overcoming the financial and economic crisis and in encouraging future economic growth.

Because of their low technological nature the added value of Bulgaria's exports remains amongst the lowest in the EU. However, because the country has a stable fiscal and macroeconomic position, there is the **potential to create a favourable environment for the functioning of innovative export enterprises** by introducing a sustainable and modern government innovation policy **through a number of mechanisms** including:

- The introduction of an **integrated approach to national policies in the field of science, technology and innovation**, implemented through a **single administrative body** (ministry or agency) and as part of an **overall national development strategy**. A number of countries, aiming for higher competitiveness, have adopted such an approach.

Application of this approach for Bulgaria may be sought in the establishment of a **Ministry of Science, Technology and Innovation,** which would undertake the political responsibility of promoting the understanding of innovation as a critical factor for sustainable economic growth throughout the government and the economy. In support of such institutional integrity, the definition of priorities within a **Strategy of Scientific, Technological and Innovation Development** of the country would help to concentrate efforts on those sources of competitive advantage (scientific fields, fields of patent activity, innovative niches) in which Bulgaria has already developed capacity and may be recognised as a technological/market leader on European and global markets.

- The reconsideration of the logic of **accumulation and spending of public funds for scientific, technological and innovation activities**.

Bulgaria's National Strategic Reference Framework,[1] the main document guiding the nation's EU funds management, states that the country relies on **external sources for financing R&D and innovation**. Indeed, the budget forecast of the Ministry of Finance for 2013 – 2015 does not envisage increasing the funds for science, technology and innovation.[2] Research and innovation are not priorities in the fiscal policy of the Bulgarian government, and are not even mentioned in the budget forecast at all.

Against the backdrop of limited financing of R&D and innovation, there is also **ineffective spending of funds** due to overlapping themes and the fact that procedures for assessment of project proposals and results of research are not rigorously applied by public funding bodies. The National Innovation Fund has barely functioned in the last three years, while the National Science Fund operates with a reduced budget, which is in turn reflected in the extremely narrowed spectrum of activities and calls for proposals. Although a variety of EU-funded schemes in support of innovation and technological development exist, the rate of absorption of these funds in Bulgaria – particularly in respect to innovation and R&D – remains one of the lowest in Europe.

- The development of a **smart specialisation strategy** and a correct approach to implement it.

Partial institutional reforms will not allow Bulgaria to emerge from its lethargy with regard to science and innovation. The current national and regional innovation systems are fragmented, administrative capacity is lacking and

[1] National Strategic Reference Framework of the Republic of Bulgaria: Bulgaria 2020, March 2012.

[2] Convergence Programme of the Republic of Bulgaria 2012 – 2015, Ministry of Finance, April 2012.

there are considerable differences in the innovation potential of the individual planning regions.

A much more intensive dialogue between the main institutions in the field of science and innovation is needed to map out a common strategy to outline the priority axes for the next programming period. Regional specialisation is a key element for the next seven years, but dialogue and a will for consultations on this subject are still lacking in Bulgaria. There is no capacity whatsoever to define and apply regional policies for science and innovation. The implementation of the principles of regional specialisation can be supported by uniting the measures for the promotion of R&D and innovation in a new **Operational Programme for Science and Innovation** that builds on the regional innovation strategies developed in the six planning regions and is guided through a smart specialisation strategy for the country.

Innovation Performance and Results of the Bulgarian Economy

Against the backdrop of the government's ambitious plans for the development of the Bulgarian economy by 2020 and the objectives around competitiveness and smart specialisation of the national and regional economies in the EU, it is discouraging to see:

- **Stagnation in the gross investment in science and innovation** (0.4 % of GDP) **and reduction of the contribution for each of the national sources of financing** – government sector (-17 % on an annual basis), business (-36 %), higher education (-23 %) and non-profit sector (-39 %); the decline is only compensated by funds for R&D from the EU;
- Continuing **failure of the government and key stakeholders (business, higher education) to implement the science–education–innovation triangle formally**, which would protect their interests and release the potential hidden in the variety of informal knowledge and know-how transfer forms existing currently between the different entities;
- **A reduction in the number of personnel engaged in R&D** (by over 14 % in 2010 compared to 2009);
- **Lack of coherence and subordination to national priorities** between sources of GDP growth, public financing and committed personnel in science and innovation.

The shrinking of the R&D sectors of the economy and the country's low industrial competitiveness result in a patent system practically unused by Bulgarian enterprises, research organisations or citizens. Bulgarian innovators still rely on the most primitive forms of protection of their intellectual product, such as keeping it secret. The bulk of patents in Bulgaria are the property of foreign companies or Bulgarian individuals. **Bulgaria is still very far from achieving technological competitiveness** and will continue to rely mainly on low costs and low prices in the near future.

The definition of priority scientific fields with potential impact on technological development and the assessment of the quality of research in Bulgaria should use **a set of criteria and indicators**, which should provide the opportunity to benchmark research institutions, evaluate the efficiency of their costs and implement an adequate policy in the drafting of public R&D budgets. Patent research and analysis should become an integral part of the information logistics of policy making in the field of science, technology and innovation. Full use of national public R&D funding instruments (Operational Programme

Competitiveness and the National Science Fund) requires the application of a **coordinated policy for the promotion of intellectual property protection**.

In addition to the decline in R&D financing and employment in Bulgaria, **the country's scientific output is also diminishing**. Controversies around the management of the National Science Fund and the Bulgarian Academy of Sciences in the last few years have led to a reduction or at least to a deceleration in the rate of research in the country.

Innovation and Sector Competitiveness: Information and Communication Technologies

The information and communication technologies (ICT) sector is of **key importance for the growth and innovativeness of the Bulgarian economy**. For example, in 2010 the average added value per employee in the sector "Development and Distribution of Information and Creative Products, Telecommunications", which amounts to a considerable portion of the ICT sector, totalled BGN 45,700 – three times the national average of BGN 16,800. There has been a stable trend of growth in **the export of goods and services of the ICT sector since 2005, with total exports exceeding EUR 2 billion for the first time in 2011**.
In 2011, Bulgaria ranked 14th in the EU27 for the export of goods and services from the ICT sector, calculated as a share of GDP. In spite of that, in terms of average annual export growth the country still lagged behind Romania, Latvia and Lithuania – and particularly Estonia – and in terms of attracting foreign direct investment in ICT behind Hungary, Romania, Slovakia, the Czech Republic and Ireland. Thus, in spite of the great expectations for the ICT sector in Bulgaria, and the fact that it is developing more efficiently than other areas of the economy, **without a decisive and substantial change in policies in this area Bulgaria cannot be expected to have a leading position in ICT** exports in Europe or even in the region.

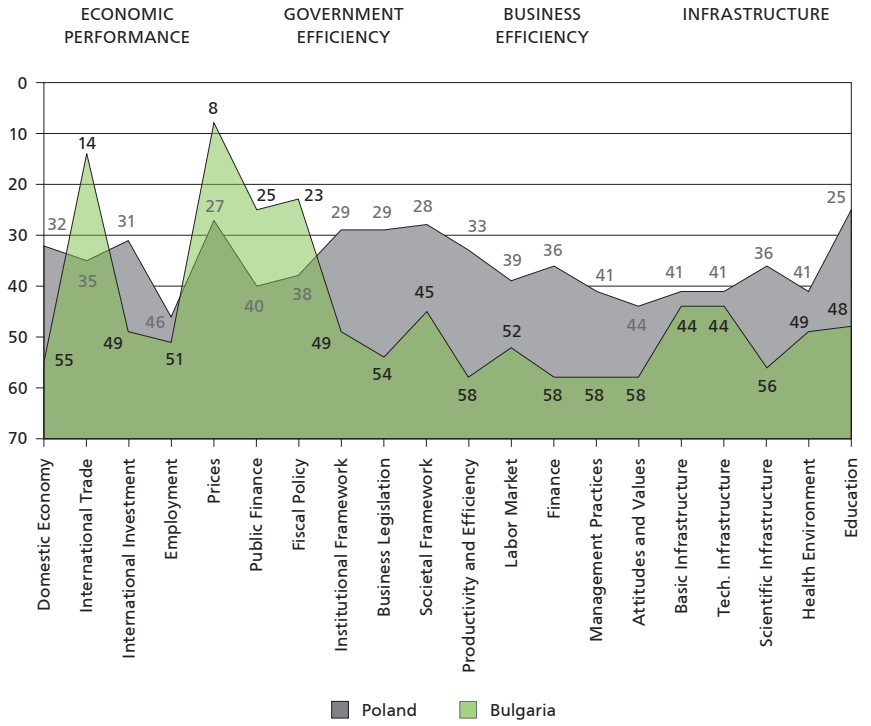
Evaluation of the added value and potential growth of ICT companies in Bulgaria shows that – contrary to popular opinion – **local companies frequently make a larger contribution to the development of the sector than international ones**. In this respect, policies in support of the development of ICT should seek **a delicate balance between providing stimuli for multinational companies and providing adequate measures for promoting local enterprises**. In addition, the number of jobs created should not be used as the sole basis for policy decisions, since they are not always related to the development of intensive research and innovation activity, which, in turn, is the main factor for a higher degree of competitiveness.

Unreliable official statistics remains a key challenge for the R&D development of the ICT sector. According to conservative expert estimates of the Applied Research and Communications Fund, there are some 120 ICT companies in Bulgaria engaged in R&D, about twice the number estimated by official national statistics. Expenses for R&D are **underestimated by on average three to ten-fold** in the individual sections of the sector, while the total number of personnel engaged in R&D is at least fivefold the officially reported.

Innovation policy should not be viewed in isolation from the wider economic policy. The modest results from R&D and innovation support measures are also a reflection of problems in the field of education, social policy, business

climate and regulatory and administrative practices. Achieving transparency, sustainability, public consensus and strategic vision on the management of the entire spectrum of economic and social policies is the only possible approach to a sustainable, balanced, knowledge-based and competent economic growth and competitiveness. For Bulgaria to come out of the trap of low costs as the main source of competitive advantage there should be **sustainable efforts over the next four to five decades for advancing the quantity and quality of human capital in the country**.

Figure 1. COMPETITIVENESS LANDSCAPE OF BULGARIA AND POLAND IN 2012



Source: IMD World Competitiveness Yearbook, 2012.

INTRODUCTION

In 2012, Europe entered its fifth year of economic and financial instability. For the first time, the ongoing crisis has increased the differences between the member states and the regions within their boundaries creating preconditions for long-term variance in the trajectories of growth of the individual economies. The **EU looks to be increasingly inadequate in meeting global challenges** such as: the shift from growth based on natural resources to knowledge-based growth; growing competition from emerging markets; and an ageing population. Given weak budgetary positions and comparatively high indebtedness of almost all key economies in Europe, it seems increasingly unlikely that the solution to the crisis lies in higher government spending for encouraging growth. Such an approach could work only if it is accompanied by: a) deep institutional reform ensuring the effective delivery of common EU policies and b) focusing available resources on fewer but better defined priorities aimed at innovation, science and education.

Against this backdrop, **Bulgaria is in a favourable position** to take advantage of the situation in the EU. Firstly, the country's debt burden is small and it has recovered quickly from the initial shock of the crisis, so it is in comparatively good condition. Moreover, its labour costs are very low and it can avail itself of a substantial additional investment resource provided by the EU. In 2011 – 2012, **Bulgaria's competitiveness still remains based on low costs and taxes and not on quality factors, education and innovation**. To reverse this, a common national vision over the next decades is required for growth that is based on quality education, entrepreneurship, and innovation.

Although there is no recipe for success, **there are established good practices and factors for growth** such as sound financial and fiscal policies, a favourable business environment, particular attention to innovation and persistence in their promotion. Apart from its fiscal stability, Bulgaria is not successful in meeting the requirements for creating a more favourable business environment and investing in education and innovation. Investment in physical infrastructure, which is the current focus of government policy, will most probably not result in qualitative changes in the potential for the development of the economy if it is

not supplemented by other policies. A radical administrative reform is needed, along with the provision of additional electronic public services. The government considerably reduced funding for innovation for 2010 – 2012 without achieving necessary reforms in the field of science and higher education. In fact, **it is the European Commission (through European funds) that is becoming the main investor in innovation and R&D in Bulgaria**.

For more than a decade t**he annual *Innovation.bg* report has provided a reliable assessment of the innovation potential of the Bulgarian economy** and the state and development capacity of the Bulgarian innovation system. It has put forward recommendations for improved public policy on innovation in Bulgaria and the EU by drawing on the latest international theoretical and empirical research while taking into account the specific economic, political, cultural, and institutional framework in which the country's innovation system is operating. During the last eight years *Innovation.bg* has made specific recommendations for the improvement of innovation policy and practice, which have been supported by business and the science sector. The absence of any concrete actions following these recommendations is indicative of a **serious institutional deficiency in the development and application of policies in this area**, despite the commitment to the process by policy makers.

Following the established methodology of the seven preceding editions, *Innovation.bg 2012* analyses the state and development capacity of the national innovation system based on five groups of indicators:

- gross innovation product;
- entrepreneurship;
- investment and financing for innovation;
- human capital for innovation;
- information and communication technologies.

Innovation.bg 2012 focuses on the **innovation potential of the information and communication technologies.**

For several years now, *Innovation.bg* has refuted some myths relating to the standard system of indicators for measuring innovation as a linear process and a result mainly of R&D. Shifting the focus to sectoral innovation systems and value added supply chains is more closely related to the concept of open innovation. For this reason, in addition to the familiar indicators of R&D intensity, the present report also uses indicators which:

- analyse the state of the national innovation system;
- measure the contribution of individual sectors to the development of the national economy;
- help to define the specific drivers of sectoral innovation activity;
- describe the mechanisms for the implementation of innovation activity and the varied forms in which its effect may be manifested.

Challenges for Bulgaria's Innovation Policy

European Innovation Policies in the Context of the Europe 2020 Strategy

The basic objectives and elements of the European scientific and innovation policy are reflected in the leading innovation initiatives of the Europe 2020 Strategy – Innovation Union, Youth on the Move and Programme in the Field of Digital Technologies. Two years after the adoption of the Strategy, its transposition in the national reform programmes of the member states is still only formal. In 2012, the EC made a summary report, which put forward recommendations to national governments, as part of the European semester for coordination of national economic policies. In an attempt to centralise the initiative to build the economic future of the continent, the EC was critical in its conclusions and found that **progress by national governments in implementing targets was too slow**, and measures and actions taken are not sufficiently effective at both the European and national levels. Furthermore, it has been pointed out that Europe is lagging behind in comparison with its main competitors like the USA, other developed countries, and rapidly growing emerging economies such as China, India, etc.

The implementation of the Europe 2020 Strategy requires a **dual approach**, which includes both **measures for ensuring financial stability** and fiscal consolidation, and **actions boosting economic growth** and competitiveness. What remains a key issue and priority is the need for more investments in knowledge and improvement in the conditions for innovation and R&D. However, it is highly unlikely that any member state would make any progress in this factor before the crisis in the euro area abates. Nevertheless, Bulgaria needs to monitor closely the priorities in the documents of the EC on innovation, because they do not always correspond to national circumstances and the necessary actions[3] related to these. The current European policies in support of innovation can be summarised in several main points:

[3] Innovation Union Competitiveness Report 2011, Research and Innovation Policy, European Commission, 2011 edition; Common Strategic Framework for EU Research and Innovation Funding, Committee of the Regions, EDUC-V-014, 2011;

1. The European Commission suggests that the **budget for investment in education, research and innovation should be substantially increased** in the multiannual financial framework over the period 2014 – 2020, promoting investments in SMEs in particular. It is necessary to take measures to overcome the fragmentation of the single European market for innovation and to ensure priority funding of those innovations that meet consumers' needs not only in Europe but across the world. It is also suggested that coordination should be strengthened between funding schemes administered by the EU and the member states. A regulatory environment is envisaged which would allow venture capital funds to operate throughout the EU and to fund new innovative companies in particular.

Funding of the modernisation of higher education will be ensured by the 2014 – 2020 financial framework, which applies three major mechanisms for funding: "Education Europe" – a single programme for education, training and youth; "Horizon 2020" – a framework programme for research and innovation covering the entire EU; and instruments of the cohesion policy – European Regional Development Fund and the European Social Fund. Special emphasis is placed on ensuring that resources received from the European research programmes and funds are used more efficiently, and mechanisms for measuring effectiveness are improved.

2. Europe generates knowledge and high achievements in science but loses ground in the use of research results and innovations. It is therefore necessary to **strengthen and improve relations between educational institutions, scientific research units and business** and to create appropriate mechanisms to realise the "knowledge triangle" – science-education-business. The instruments of **government spending should be used more efficiently**: state aid, public procurements, pre-commercial public procurements and public funding of the development of innovative products and services. More attention should be paid to non-technological and social innovation, as well as to open innovations.

3. Training qualified specialists requires the modernization of higher education in Europe; adaptation of the profiles of researchers to the new priorities of market demand; and application of flexible innovation approaches and teaching methods using IT and other new technologies. Establishment of a European area for higher education and removal of barriers to educational mobility is of particular importance. In this respect the European Commission plans to develop an "index of mobility".

4. The European Research Area (ERA) is not being built in a consistent manner, which integrates all policies and factors for its implementation. ERA's basic elements[4] are not fully implemented and obstacles at the national level have not been overcome. **There are numerous regulatory restrictions to the flow of knowledge between the member states** which is intermittent and usually concentrated among several Western European countries. In practice, European research programmes escalate the brain drain and knowledge from the new member states and assign them a secondary position.

European Parliament resolution of 20 April 2012 on modernising Europe's higher education systems; Communication from the Commission: Single Market Act, Twelve levers to boost growth and strengthen confidence, "Working together to create new growth", COM(2011) 206 final; Taking forward the Strategic Implementation Plan of the European Innovation Partnership on Active and Healthy Ageing, Brussels, 29.2.2012, COM(2012) 83 final.

[4] A flow of competent researchers; establishment of world class research infrastructure; modernisation of research institutions; coordination of the research priorities and programmes of the member states; efficient transfer of knowledge; opening of Europe to the wider world of science.

5. In sectors requiring intensive use of knowledge, there needs to be a faster structural change in Europe to achieve sustainable economic competitiveness. Improving the innovational capacity and competitiveness of the EU requires strengthening of the intensity of research in high and medium-tech industries together with an equitable distribution of competitive factors across the regions in Europe. This can result in new technologies and innovations, which can respond to basic public challenges.

In 2012, the European Commission put forward new recommendations for the development of Innovation Partnerships.[5] Through this initiative a new approach to the links between research, development and innovation is advanced as well as coordination of innovation efforts in the public and private sectors and acceleration of the implementation of innovations. There are **three main areas**, in which opportunities for partnership are identified:

a) **Sustainable supply of raw materials** for a modern society and resource efficiency. Increase of domestic production in Europe is targeted, as well as creation of innovative products, new technologies to develop substitutes, etc.;
b) **Resource efficiency for sustainable and productive agriculture**. Food security is a global challenge, which can only be addressed through steady development of R&D and innovation;
c) **Innovation in the field of active and healthy ageing**. Ageing is one of the grand societal challenges for Europe. Establishment of a "market for innovative ideas" in this area is envisaged.

Bulgaria in the Context of the European Innovation Policy

The previous seven *Innovation.bg* reports made a comprehensive analysis of the country's state of innovation and innovation policies at the governmental, regional and company levels. On the basis of the findings some recommendations and suggestions[6] were put forward, which were submitted to the stakeholders of the annual National Innovation Forum including the President, the Prime Minister, ministers, representatives of various scientific, university and business organisations and representatives of non-governmental organisations.

Despite government statements that science and innovation are priorities, the **significance and role of science and innovation in improving competitiveness and ensuring that more concrete action occurs to support the sustainable growth of the economy is not sufficiently appreciated** by the government officials. There is no capacity for development and implementation of integrated policies for innovation, science and higher education. In fact, there has not been enough political will, readiness and initiative for more significant steps to solve pressing problems. The National Innovation Council at the Ministry of Economy, Energy and Tourism exists only formally. **In recent years, national public funds for**

[5] European Innovation Partnerships were introduced as a key initiative in the Europe 2020 flagship Innovation Union. Each partnership is governed by a steering group chaired by the respective Commissioner(s). Member states, members of parliament, business, researchers, NGOs and other stakeholders are all represented at the steering group. The partnerships address the weaknesses in the European research and innovation system which complicate the discovery or exploitation of knowledge and, in many cases, ultimately prevent the entry of innovations into the market place.

[6] The reports are available at the web page of the Applied Research and Communications Fund: http://www.arcfund.net/index.php?id=2060

the development of research and innovation have been significantly reduced. Estimates disclosed by the Ministry of Finance for 2013 – 2015 are worrying, as they do not foresee any increase in resources for science. Bulgaria is still acknowledged as being a "modest innovator" in a number of public documents and in assessments by European institutions.

In the last couple of years the Bulgarian government has produced several strategic documents for the development of Bulgaria in response to Europe 2020 Strategy. These documents address some of the mounting challenges of science and innovation in the country. Though they are a step in the right direction, most stakeholders view these documents only as necessary paperwork to address EC demands and not as a genuine display of will for action on the part of the Bulgarian government.

The **National Reform Programme 2014 – 2020**[7] emphasises that innovation policy is one of the key areas, which will improve the competitiveness of the Bulgarian economy and the development of the potential for growth in the post-crisis period. The Programme envisages:

- increased investments for R&D up to 1.5 % of GDP by 2020;
- expanded access to finance for SMEs;
- a targeted state policy to support innovation;
- adoption of a Law on Innovation and development of a new national innovation strategy and amendments to the Law on Investment Promotion to create incentives for investment in high-tech production and services;
- more efficient use of OP Competitiveness by speeding up the implementation of calls associated with technological modernisation of SMEs and large enterprises, projects for the advancement of applied research, establishment of R&D centres, development of clusters, etc;
- measures to improve the quality of scientific research, strengthen its applied orientation and improve science-business relations.

The **National Development Programme Bulgaria 2020**[8] foresees:

- support for the development of a high performance industrial base;
- encouragement of innovation and scientific research;
- development of human resources for the needs of innovative enterprises;
- advancement of the scientific and innovation infrastructure and environment stimulating cooperation between science and business;
- improvement of the regulatory framework for the agents of innovation processes, as well as more effective organisation and management of the scientific and innovation processes covering all stakeholders in the national scientific and innovation field.

The need for cooperation between universities, R&D organisations and industry is stressed, as well as the acceleration of knowledge transfer. It is also important to promote the introduction of new business models for SMEs and introduction of new products and technologies. The Programme further promotes a more active participation of enterprises and scientific organisations in international innovation networks, collaboration with partners from other countries and internationalisation of the innovation process.

[7] National Reform Program 2014-2020 /Section III. Smart Growth/; National Development Program "Bulgaria 2020" (first draft of 16 March 2012, Priority 5: Support for a high productivity industrial base and modern innovation infrastructure, encouraging research and innovation); National Scientific Research Strategy 2020; Draft Law on Innovation.

[8] First draft of 16 March 2012, Priority 5.

Bulgaria's **National Scientific Research Strategy** to 2020 is currently the primary national document in the field of innovation policy. It states some objectives relating to science policy and measures and instruments for ensuring higher quality of research and innovation:

- One of the main objectives of the strategy is to focus public-private resources and investments on priority areas for the development of the country;
- Another goal is to improve the coordination of policies in the field of education, scientific research and innovation, and enhance the free movement of people, knowledge and technology;
- In addition, it defines the objectives and priorities in the establishment of a competitive national research infrastructure as an element of the European Research Area and focuses on the acceleration of the integration between scientific organisations, universities and their relations to business in accordance with societal priorities, as well as the modernisation of R&D organisations and enhancing the status of scientists in society.

The Strategy also defines the following priority thematic areas, although it is not clear on what grounds these have been selected:

- Energy, energy efficiency and transport;
- Development of green and environmentally friendly technologies;
- Health and quality of life, bio technologies and organic food;
- New materials and technologies;
- Cultural and historical heritage;
- Information and communication technologies.

The Strategy points out a number of weaknesses in the science policy of the country:

- There is no efficient management of human resources and no vision for attracting young professionals to science;
- There is no current or planned financial policy to ensure the development of science and the concentration of resources to priority areas;
- Outdated research infrastructure;
- Insufficient coordination between education, science and innovation.

The Strategy refers vaguely to innovation activity, which confirms that **there is no integrated approach in dealing with research and innovation** in the country. The National Scientific Research Strategy is a good start in this direction, but it should be linked to the other national strategic documents and provide the establishment of an integrated institutional framework of science, technology and innovation.

A major challenge for the Bulgarian government is to provide efficient organisation and good management of activities related to the Europe 2020 Strategy and the national programmes and policies. A professionally trained, responsible and efficient public administration, working under a common vision for the development of science, higher education and innovation, is needed to implement these programmes. The lack of vision in this respect and the deficiency in the quality of administrative services are probably the most serous obstacle to the development of the Bulgarian innovation system.

Bulgaria should continue its efforts to participate more actively in the design and implementation of European policy for science and innovation. Taking into account common European interests and goals, national interests should be openly stated, advocated and protected in a consistent, reasonable and

competent way. It is necessary to define what Bulgaria's expectations and aspirations from the EU are, such as:

- a more differentiated science and innovation policy for new member states;
- more funding and more targeted use of the Cohesion Fund and other funds aiming at bringing Bulgaria closer to the developed member states in the EU with respect to innovation;
- simplified procedures for preparing, approving and implementation of projects under the European programmes and funds, reduced red tape and streamlining the numerous and overlapping documents in the field of innovation.

The policy findings and recommendations of the previous *Innovation.bg* reports are still applicable in 2012, but when planning for the next budget period of EU 2014 – 2020 **more consideration should be given to some of the following issues**:

1. **Improvement of the governance and management of R&D and innovation in Bulgaria.** The existing system and practices have not been properly designed and do not work effectively. The administrative capacity for managing the national innovation system must be modernised and focused in order to **improve radically the efficiency of government policy** in the fields of science, higher education and innovation. The development of a new national innovation strategy should be accelerated to meet the commitment made in the National Reform Programme for this to happen by the end of 2014. The strategy should provide for a new structure of the state administration responsible for the preparation and implementation of the national innovation policy, which should:
   - **establish a ministry** responsible for innovation, science and technologies, including ICT and higher education;
   - **merge the administrative structures** of the sectors mentioned above in a single agency or department within this new ministry; the model of the Innovation Norway agency could be adopted.[9] Departments covering investment, small and medium enterprises, export insurance, public procurement, as well as the sectors ICT, science and higher education could be merged in the new structure. This kind of merging would create significant economies of scale;
   - achieve an adequate **concentration of state financial resources for science and innovation**. The new structure should control these financial instruments: National Science Fund, National Innovation Fund and the Bulgarian Development Bank.

It is necessary to introduce modern management of science and innovation. The government should initiate the **establishment of a smart regulatory framework** and criteria, which give clear direction to the development of scientific, technological and innovation development and support innovation. In this respect, the draft Law on Innovation needs significant improvement to accommodate more ambitious innovation policy goals.

2. **Considerably greater public financial resources are needed for the development of science, higher education, technologies and innovation.** This should be coupled with a concentration (reduction), modernisation and reform of basic public structures and institutions in these areas. The

[9] All business support agencies in Norway are united under Innovation Norway.

two funds, NSF and NIF, should be merged and funding focused on priority themes, innovative products, processes, etc. A more efficient and coordinated approach should be applied to the utilisation of resources under European funds and operational programmes, as well as from the Bulgarian Development Bank and the financial engineering instruments by the JEREMIE programme.

A new **OP Science and Innovation should be proposed** for the new budget period of EU 2014 – 2020, which should include higher education, e-government and ICT, and the regional component of innovation in OP Regional Development should be strengthened. For this purpose, more substantial development of the administrative capacity at NUTS 2 level (planning regions) should be achieved. One way to advance the innovation capacity of Bulgarian regions is to update their Regional Innovation Strategies developed with EU support in the period 2002 – 2008.

3. **Industrial and agricultural production, financing new competitive products, export and opening up new markets should be encouraged through R&D, new technologies and innovations.** The share in exports of high-tech products is quite low. In the last decade it has been within 4 – 8 % according to MEET, and 1.7 – 3.5 % according to Eurostat.

Bulgaria does not have the potential to develop a large diversified industry based on technological leadership. Thus, particular attention to **technological niches** is required. Important future markets are green industries, including energy efficiency technologies, recycling and waste management, mobility and transport technologies, nanotechnologies, etc. Innovation policy should focus both on key products and services in high-tech sectors, and the ones, in which Bulgaria has a comparative advantage and national know-how.

Design should be regarded not only as related to the form of products and processes, but also as key to their functions, which in turn affects the introduction of new ideas to the market. In the process of designing new technologies resulting from R&D and new creative ideas, inventiveness and entrepreneurship, their integration into competitive products, processes and services takes place. Thus, the construction of design engineering centres in major business structures, universities and research organisations should be considered.

It is very important to provide incentives for innovations in the services sector and particularly in the field of **social innovation** and public administration. This could be incorporated in the long overdue administrative reform in the country.

4. **National technological platforms have to be developed in order to determine the national innovation priorities,** which would open up opportunities for international cooperation. Several technological fields such as energy, health, mobility, communication and security connect research strategies with future markets and public needs. Some advanced technologies (nanotechnology, biotechnologies, ICT, mechatronics, etc.) are of particular importance to this process.

The government and the civic sector should provide broad support for the **new forms and structures for innovative and technological activity**: clusters, high-tech business incubators, scientific, technological and innovative centres, entrepreneurship centres, intermediary structures for transfer of technologies, joint structures between universities, scientific organisations and businesses. Many

of these exist only nominally and correspond to their European counterparts in name only. **Such formal approach to the establishment of these bodies needs to be abandoned.**

Box 1. WHAT THE DRAFT LAW ON INNOVATION DOES (NOT) INCLUDE*

The draft Law on Innovation published for public discussion by the Ministry of Economy, Energy and Tourism **does not meet the social expectations in this area**. It regulates only the content of the innovation activity of economic entities and institutionalises an already existing institutional structure – the National Innovation Council and the National Innovation Fund, without prescribing the proper mechanisms for its effective functioning. Although **a step in the right direction**, these measures are insufficient to justify increased spending of public resources on the adoption of such a law.

Given the unenviable position of the country in the international rankings of innovation, the anti-innovative behaviour of consumers in the domestic market and the inefficient use of financial and human resources for innovation, such a law should introduce at least some of the **measures that have long-existed in the global innovation management practice**, and which have been omitted from the version proposed for public discussion:

1. **Tax incentives** to encourage innovative enterprises. These could include: waiving social security contributions when opening up highly qualified job positions; allowing for tax deductible expenses for innovation incurred by the company or commissioned to another entity, research institute or higher educational establishment; creating a status of "innovative enterprise", which is granted under certain conditions and on the basis of which companies get the right to a package of tax breaks and other incentives and an easier access to public funding; allowing duty-free import of scientific instruments and apparatus imported for scientific purposes or training by organisations for which research and teaching are not their main activity; giving back to higher education institutions, research institutes and enterprises 50 % of the tax revenues generated by them from research and innovative activity and sale of intellectual property rights; tax holidays for scientists, researchers and highly qualified personnel who return to work in Bulgaria. The application of tax incentives to promote company innovation activity is a successful practice in many European countries, including Belgium, UK, Denmark, Germany, Estonia, Ireland, Spain, Latvia, Poland, Finland, etc. Their introduction aims at bringing to light the company's hidden costs for R&D.

2. Introducing **pre-commercial procurement** and mandating legislative and executive authorities at the national, regional and local levels to use the tools of pre-commercial procurement.

3. Promotion of **academic entrepreneurship.** Public universities should obtain title to properties which could be part of an innovation/business incubator or a technological park and research and academic staff in universities, scientific research units and enterprises should be allowed sabbaticals of up to three years (paid leave up to a year and unpaid leave up to two years) in order to establish a high-tech enterprise.

Box 1. WHAT THE DRAFT LAW ON INNOVATION DOES (NOT) INCLUDE (CONTINUED)

Without such bold initiatives the draft Law on Innovation will not allow for the realisation of the full innovation potential of the Bulgarian economy or for the adequate involvement of Bulgarian enterprises and science in the development and implementation of new European and international technology solutions.

* The Applied Research and Communications Fund was involved in the drafting of a Law on Innovations on commission from the Ministry of Economy, Energy and Tourism.

Source: Applied Research and Communications Fund, 2012.

Gross Innovation Product

The Gross Innovation Product of an economy – its innovativeness – is assessed by the new products and services introduced, the new technologies created and the scientific outputs. It results from the interaction of the innovation, technological and scientific products of a country. It is a major benchmark for innovation policy because it allows decision-makers to compare the outcome of the innovation system in temporal and geographical terms, as well as to estimate the needs for changes in the organisation and resources of the innovation process.

Innovation Product

The innovation product results from new and significantly improved processes, products and services based on new and/or adapted knowledge and know-how. It is determined by the innovation activity of enterprises in the country and is the most important indicator for assessing the national innovation system. Innovation activity in business and innovation demand by the people, along with the factors which determine these, comprise the innovation potential of an economy – its capacity to develop on the basis of new knowledge.

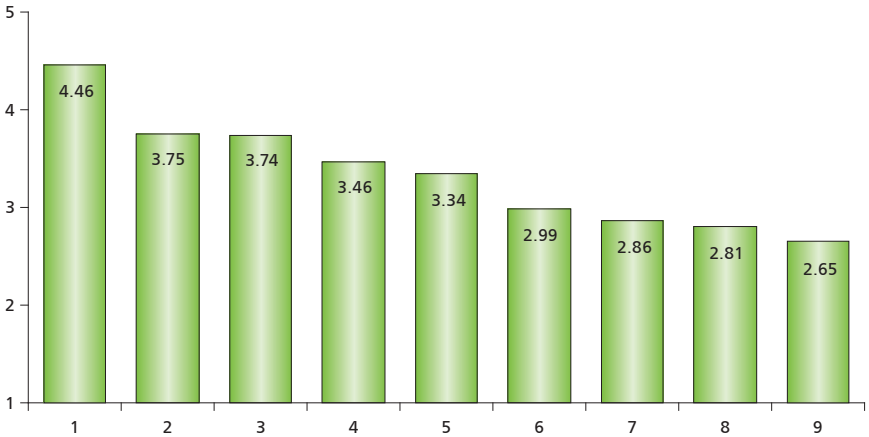
Demand for Innovation

In the last few years, cultural differences are increasingly referred to when studying innovation and entrepreneurial behaviour of economic agents. The study of innovative behaviour using a limited number of criteria cannot provide accurate results and careful interpretation of the estimates obtained in each case is required. Nevertheless, generalisations made about the cultural characteristics of Bulgaria correspond largely to the findings of international analyses of innovation activity:

- strong aversion to uncertainty – what is unfamiliar is perceived as dangerous, as a result of which it is difficult to establish proactive behaviour, including in innovation activity;
- strong power hierarchies – there is considerable dependence of subordinates on superiors and no inclination for consultation or for taking of responsibility for co-decision;
- collectivism – Bulgaria is one of the most collectivist countries in Europe which leads to a feeling that individual efforts are meaningless, and a lack of personal accountability;
- affinity for both professional performance and personal ambition, on the one hand, and relationships of mutual aid and compassion, on the other.

Although European countries strive to achieve a common goal – making Europe the most competitive knowledge-based economy in the world – both the implementation of national approaches to science and technology policy, and the achievements in its implementation remain highly diverse and subject to cultural differences. According to research by Innobarometer,[10] when compared to the rest of the EU, **Bulgaria's population has one of the largest proportions of people who adopt innovations reluctantly and/or completely reject them (anti-innovators).**

Figure 2. FACTORS INFLUENCING THE DECISION TO PURCHASE A NEW OR IMPROVED PRODUCT (AVERAGE SCORE ON A SCALE OF 1 TO 5, SAMPLE SIZE: N=1800)



Source: Applied Research and Communications Fund, 2012.

In 2012, ARC Fund conducted the second National Survey of Innovation Demand.[11] The results indicate that consumers in the country have a strong disposition towards imitation and are generally weak when it comes to innovative behaviour. The following conclusions about demand for innovation among the citizens of Bulgaria with regard to the nine factors influencing the purchase decision could be drawn:

[10] In order to analyse the cultural diversity in relation to innovations in the EU and measure the differences between European countries regarding entrepreneurship, culture of innovation and the conditions for the generation and application of new knowledge, the EC conducted specialised research at the end of 2005, based on the methodology of the annual Innobarometer. Depending on the degree of receptivity to innovation, respondents were divided into four groups – enthusiasts (11%), attracted (39%), reluctant (33%), and anti-innovators (16%).

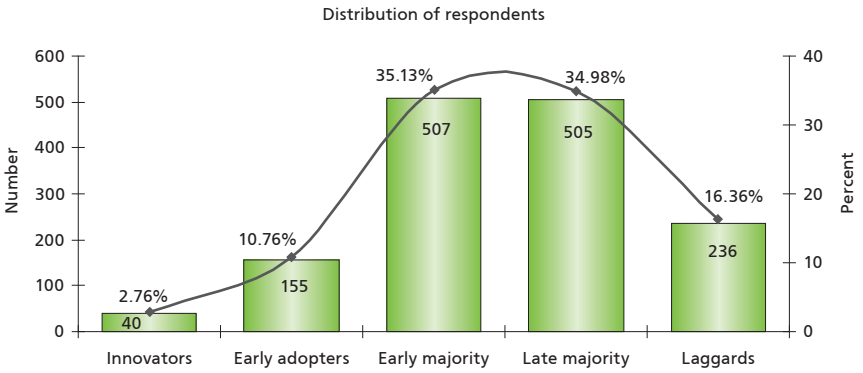
[11] The research was conducted at the end of 2011 by Vitosha Research Agency. In a representative survey for Bulgaria the influence of various factors on consumers' decision to purchase new/advanced products was estimated.

- The less innovative (respectively more imitative) the consumers' behaviour is, the more significant a factor **price** becomes in the decision to purchase new products. Innovators are willing to pay any price; it is not an obstacle but rather an incentive as it allows them to stand out and to distinguish themselves from others (presence of a direct link between price and demand).
- **Promotions** are an important incentive for making purchasing decisions for individuals who tend to imitate. Innovative-minded consumers would certainly benefit from the terms of a promotional programme but the effort to anticipate the acquisition of new products would be crucial. The factors ranked at the top three places by Bulgarian respondents are the key drivers in the imitator consumer's behaviour, while those ranking the last three places are typical determinants of the behaviour of innovators.
- **Recommendations from friends** are part of interpersonal communication, whose impact is a key driver of the behaviour of imitators. Innovators are not influenced by somebody else's consumer experience and take their own independent decision drawing information about new products exclusively from the media (advertisement, publication in specialised editions, the internet etc.).[12]

Innovation Index of Consumer Demand

Based on twelve variables related to socio-economic, personal and communication characteristics of the respondents, the Applied Research and Communications Fund constructed the **innovation index of consumer demand**. Each respondent is rated on the innovation index at a value between 12 and 36. The higher a person's rating is, the more innovative they are. On the basis of the innovation index the respondents were distributed in five groups.[13] The groups were identified accordingly as **innovators, early adopters, early majority, late majority and laggards.**[14] The validity of the model to the Bulgarian market when studying the diffusion of mobile phone services was confirmed in 2009.[15]

Figure 3. CLASSIFICATION OF CONSUMERS BASED ON THE ROGERS MODEL



Source: Applied Research and Communications Fund, 2012.

Some important **conclusions** were drawn on the basis of the survey. Two sets of factors have a major influence on individuals belonging to one or another group of innovative behaviour – (a) personal characteristics (psychological profile) of the individual and (b) demographic and socio-economic characteristics (educational level, income, profession, place of residence etc.). It is difficult to influence the first set of (psychological) factors, but changes to socio-economic and demographic conditions can result from purposeful, coherent actions (by the state and its institutions).

Despite the claims of some authors that **age** does not determine an individual's innovativeness, data for Bulgaria show that there is a strong correlation between the two variables – with advancing age the level of innovation decreases. Higher **level of education** is also associated with higher innovativeness. Nevertheless, if the two extreme groups, innovators and laggards, are excluded – education is not a key factor in determining which of the other three groups individuals fall into.

There is a strong correlation between innovativeness and social standing. More innovative individuals tend to have **higher status professions**. This in turn makes them role models for individuals with a lower degree of in-

[12] Innovative Bulgarian companies seem to be good at capturing the significance of these factors. According to the latest (covering 2008 – 2010, published in 2012) NSI survey of company innovation, only marketing innovations have slightly increased (1.8%) compared to the preceding three-year period. The overall drop of 3.7% in innovation activity is due to fewer product, process and organisational innovations.

[13] In determining the size of the groups the logic of Everett Rogers is followed (Rogers, E., Diffusion of Innovations, 5th Edition, Free Press, 2003, p. 280).

[14] It is assumed that the group of innovators represents 2.5% of the consumers in a market, the group of quick adopters – 13.5%, the group of the early majority – 34%, the group of the late majority – 34% and the group of the laggards – 16%. The criterion to distinguish between users is the speed with which they react to the new products/services.

[15] Yordanov, R., "Валидиране на модела на Роджърс в контекста на българския пазар на мобилни телефонни услуги", in *Business Management*, journal published by the D. Tsenov Academy, No. 1, 2009.

Table 1. CHARACTERISTICS OF CONSUMER GROUPS ACCORDING TO THEIR INNOVATION BEHAVIOUR

Consumer Groups	Specific Characteristics
Innovators Innovation index values – from 32 to 36. Relative share – 2.76 %	Young people; living in cities; risk-prone; very sociable; prestigious profession and high income; influential; optimists; carefully consider their actions; consumers who are least influenced by friends and relatives when making purchasing decisions; strong individualists.
Early adopters Innovation index values – from 28 to 31. Relative share – 10.76 %	Young people; living in large and medium cities; not afraid to experiment with innovations; not risk-averse; adventurers in spirit; with prestigious professions; very sociable, but trying to limit the circle of new acquaintances; influence others; when purchasing new products influenced by family and friends; income around the average, but considerably lower than that of innovators.
Early majority Innovation index values – from 24 to 27. Relative share – 35.13 %	Older than the innovators and the early adopters; live mainly in large and medium cities, though quite a few live in villages and towns; seeking to reduce risk; have fewer social contacts than the first two groups of consumers; define their profession as non-prestigious; have lower income and are much more concerned about covering their daily expenses; more sceptical; more traditionalist-minded; greatly influenced by relatives and friends when purchasing new products.
Late majority Innovation index values – from 20 to 23. Relative share – 34.98 %	
Laggards Innovation index values – from 12 to 19. Relative share – 16.36 %	The oldest among consumers; about a third of the group live in villages, medium cities and towns; strive to minimise or totally exclude risk; have few social contacts; define their profession as non-prestigious; low income; concerned about covering their costs; generally have the lowest education; avoid innovations; believe that their opinion is not valued by others; skeptics; traditionalists; adopt new things when they have become a norm for the market.

Source: Applied Research and Communications Fund, 2012.

novativeness. The less an individual is innovative, the longer it takes them to make a decision to purchase a new product. Having purchased the product, the less innovative minded consumers start to doubt whether they have taken the right decision.

Although innovative consumers live in both cities and villages, it is **much more likely that an individual would be innovative if they live in a city**. Accordingly, the bigger the city, the more innovative an individual's behaviour will be.

Technological Product

The technological product (protected and unprotected new technological knowledge) is a result of the creative activities of the participants in the process. Its unique characteristics and economic significance make it attractive as an object of transfer. The analysis of applicant and patent activity, as well as the attitudes of Bulgarian and foreign persons in this field make it possible to assess an essential aspect of the innovation system operation and to seek ways of improving it.

In the period 2001 – 2011, 10,320 innovation patents were issued in Bulgaria in the eight sections of the International Patent Classification (IPC),[16] the majority of which (9,239, 89.5 %) belong to foreign patent holders, and a little over one tenth (1,081, 10.5 %) to Bulgarian holders.[17] Significant differences were ob-

[16] IPC consists of eight sections: **A** – Human Necessities; **B** – Performing operations, Transporting; **C** – Chemistry and Metallurgy; **D** – Textiles and Paper; **E** – Constructions, Mining; **F** – Mechanics, lighting, heating, engines and pumps, guns and ammunition; **G** – Physics; **H** – Electricity.

[17] The study covers the period 2001 – 2011. Previous periods were not included because earlier the prevailing share of patents were those granted on the basis of transformed author certificates, and their participation in the study would have led to possible difficulties and inaccuracies in interpretation of the results. In 2000, the transformation of author certificates into patents finished.

served in the pace of development of patent activity. The total number of patents (with Bulgarian and foreign holders) showed an upward trend of 18.18 % on average per year, within which there was a positive average annual growth rate of foreign patent holders (23.65 %) and a negative average annual growth rate of Bulgarian patent holders (-3.77 %).

A clearly discernible change occurred after 2004. **Overall patent activity began to be determined entirely by foreigners.** There was a marked increase in the number of patents granted to foreign holders, from 288 in 2001 to 1,557 in 2011, i.e. 5.4 times as many. Moreover, foreign patent activity is considerably higher than the Bulgarian, this trend being exacerbated in the last seven years of the period by the difference of up to 24 times the respective Bulgarian patent activity in 2011.

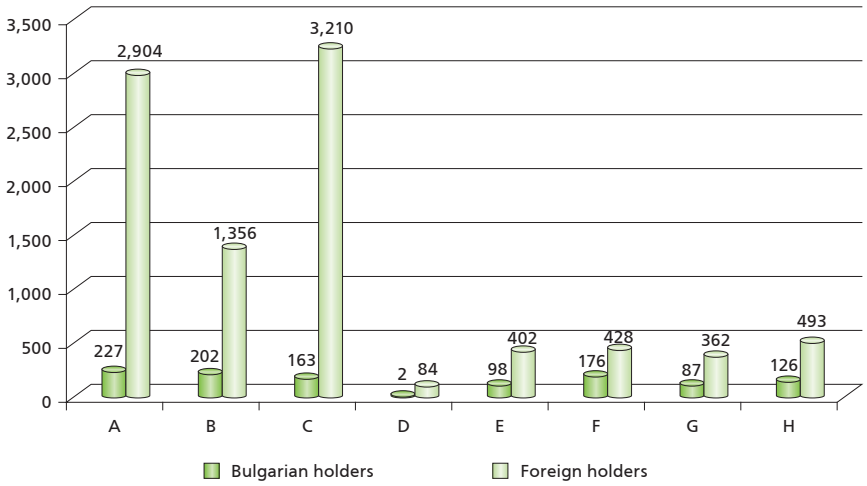
One reason for the dominance of foreign patents after 2002 is that at the time Bulgaria became a member of the European patent system, which facilitated the procedure for issuing patent coverage in Bulgaria of foreign individuals and legal entities. Since then European patents have been valid in Bulgaria and very few areas in the technological development of the country have remained free from exclusive rights. For the period from 2005 to 2011, 7,125 European patents were validated and have effect in Bulgaria.[18] In 2011, the majority of patents (96.5 %) granted to foreign holders were validated European patents and only 3.5 % were issued under the national procedure.

The aggressive presence of foreign exclusive patent rights in the country can be regarded as having an unfavourable effect on the competitiveness of the Bulgarian economy. **It is now much more difficult for Bulgarian companies and organisations engaged in R&D to use leading technologies without infringing foreign patent rights.** To maintain and enhance their competitiveness, they would be forced to reconsider their technology policy and be more active in innovation.

The increased presence of foreign patent holders on the territory of Bulgaria is an indication of the interest of foreign, and especially European, business in the Bulgarian market, and of foreign investors' strategies to protect their new technologies with Bulgarian patents as a first step to subsequent investments. Meanwhile, the last few years have seen an increasing number of foreign intellectual property management companies seeking to identify and purchase

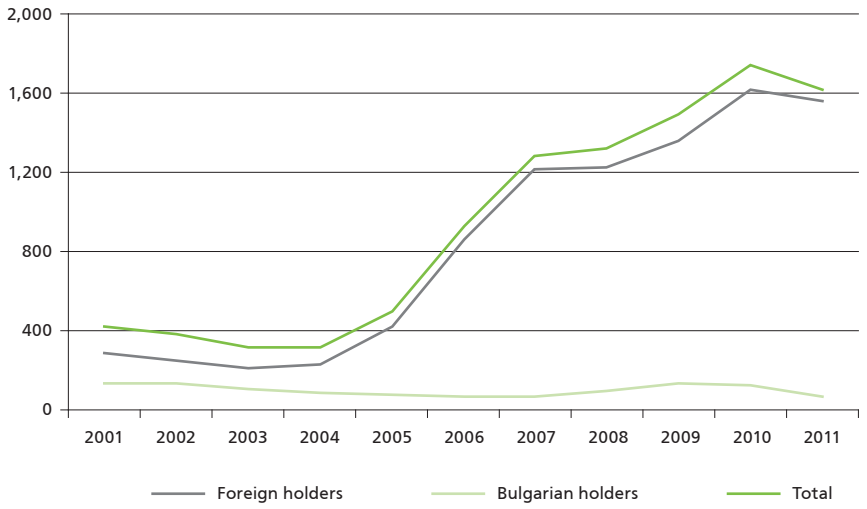
[18] Based on data from the Official Journal of the BPO.

Figure 4. NUMBER OF PATENTS ISSUED IN BULGARIA BY TECHNOLOGICAL FIELDS (IPC SECTIONS) AND BY NATIONALITY OF PATENT HOLDERS, 2001 – 2011



Source: Based on data from the Official Journal of the Bulgarian Patent Office, 2012.

Figure 5. DYNAMICS OF PATENT ACTIVITY IN BULGARIA, 2001 – 2011, NUMBER OF PATENTS



Source: Based on data from the Official Journal of the Bulgarian Patent Office, 2012.

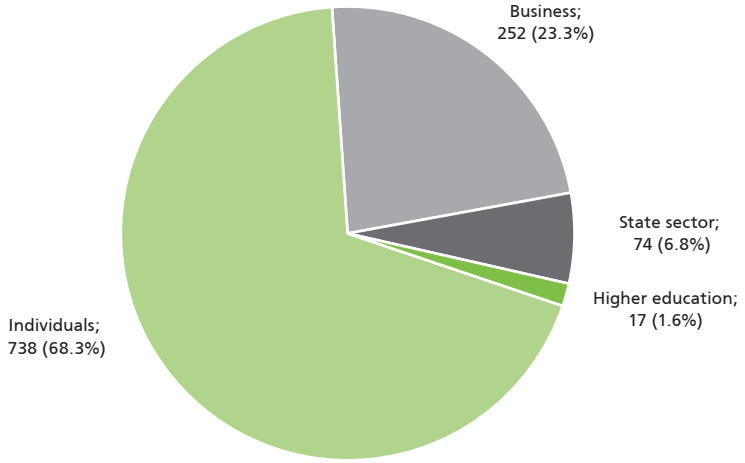
technologies from Bulgarian research and production organisations at a pre-marketing stage, and later commercialise them in a foreign market.

This trend is particularly apparent in some high-tech fields like ICT, biotechnologies and pharmaceuticals. Over the past decade the in-house R&D model and activities of the local companies in these fields was firmly established, and in particular in the ICT sector. In addition, there is a well-developed pattern of development of innovative products made by Bulgarian firms and ordered by multinational companies in the sector. Although in the latter cases intellectual property rights remain with the contracting (foreign) entity, the local company often gets partial rights, for example, to use the product as base for accompanying innovations, for product distribution to regional markets or representation with new global clients. The latter two trends reflect on the patent activity of Bulgarian and foreign companies and individuals, leading to an increase in the share of foreign patent holders, though the stages of the technological development of innovations are carried out by the Bulgarian contractors.

For the eleven-year period 1,081 innovation patents altogether were issued to Bulgarian holders. After 2009 there was **a decline in Bulgarian patent activity**, with only 64 patents registered in 2011, half the number of those issued in 2001 and 2009.

In terms of institutional affiliation of patent holders, **individuals have been most active** with 738 patents registered, followed by the business sector with 252, and the higher education sector with 17. As mentioned in previous editions of *Innovation.bg*, this confirms the **unsystematic nature of patent activity in Bulgaria**; the companies' preferred method of preserving their intellectual assets is to maintain secrecy. Such conduct is

Figure 6. INSTITUTIONAL STRUCTURE OF BULGARIAN PATENT HOLDERS IN BULGARIA, 2001 – 2011, %



Source: Based on data from the Official Journal of the Bulgarian Patent Office, 2012.

Box 2. PROBLEMS IN THE CERTIFICATION PRACTICE FOR THE PROTECTION OF NEW PLANT VARIETIES AND ANIMAL BREEDS

One of the tasks of the Agricultural Academy (AA) is the creation of new and improved plant varieties and animal breeds. Varieties developed in the AA are recognised, with very few exceptions, by the Executive Agency for Variety Testing, Field Inspection and Seed Control (EAVTFISC) under the Ministry of Agriculture and Food, and received successfully legal protection by the Patent Office. They are sought after by farmers and seed producers not only because of their qualities, but also because they have been designed for Bulgarian soil and climatic conditions. The protection of new plant varieties and animal breeds, however, encounters a number of problems.

- The certificate obtained under Art. 18 of the Protection of Law on New Plant Varieties and Animal Breeds does not cover some key activities related to the right of use, such as maintaining variety, production of seeds and seedlings, trade in seeds and seedlings, as well as license contracts for their implementation.
- The lack of more detailed legislative and regulatory framework, as well as the lack of connection and cooperation between institutions leads to violation of the rights of breeders and owners of certificates. Many farmers and cooperatives buy basic seeds for their own needs without registering their seed production in EAVTFISC. Thus, they save money by not certifying seeds and by not paying the royalty. In this respect, the following steps should be taken: when applying for grants from national funds (per unit area), farmers should be required to use certified seed; basic seeds should be provided only to licensed seed producers; and royalties should be included in the price of the seeds sold.

Over the past 20 years, and especially since Bulgaria's entry into the EU, the system of recognition of varieties/hybrids has been considerably facilitated. Powerful companies have substantial financial resources not only for breeding and research, but also for implementation and dissemination. The financial resources available to the institutes of the AA do not make them competitive in the promotion and distribution of new varieties/hybrids.

Source: Agricultural Academy, 2012.

due mainly to two factors – the small average size of Bulgarian enterprises, on the one hand, and on the other, the **lack of confidence in the official patent system**.

The business sector has a total of 252 patents held by150 patent-holder firms spread in 38 cities over the period 2001 – 2011. 19 companies (12.7 % of all 150 patents submitted) located in 10 cities own a total of 40.5 % of the business sector's patents, which is indicative of a relatively good geographic distribution and opportunities for the concentration of technical capacity in various regions of the country.

The low level of institutionalisation of patent activity in Bulgaria is a challenge that has a number of facets:

- Due to the low level of R&D expenditure, invention and patent activities, which are not institutionally organised and funded are growing, as is individual innovation based mainly on interesting and original ideas by individuals (independent innovators).
- Most independent innovators are science teachers, scientists and researchers, using official resources for their research, who have themselves created their patented inventions.
- When resulting from work performed under an employment contract, patents should normally belong to the institution, which has organised and funded the scientific research. However, organisations in Bulgaria do not or rarely allocate funds for patenting and voluntarily give up their possession of patents. They do not acquire rights over the inventions created by their employees and thus, are deprived of the opportunity to capitalise on their scientific achievements and derive economic benefits from them. In this sense, **it is recommended that funding instruments creating innovative scientific products have specific measures to maintain intellectual property**.

Table 2. BULGARIAN COMPANIES HOLDING BULGARIAN PATENTS, 2001 – 2011

№	Company	Location	Number of patents	%
1	SOPHARMA JSC	Sofia	20	7.9
2	BIOVET JSC	Peshtera	9	3.6
3	HYUNDAI JSC	Sofia	9	3.6
4	BALKANPHARMA-DOUPNITSA JSC	Doupnitsa	7	2.8
5	BALKANPHARMA-RAZGRAD JSC	Razgrad	6	2.4
6	ARSENAL JSC	Kazanluk	5	2.0
7	VMZ JSC	Sopot	5	2.0
8	LB BULGARICUM SMJSC	Sofia	5	2.0
9	LACTINA OOD	Bankya	5	2.0
10	NON-FERROUS WORKS JSC	Plovdiv	4	1.6
11	KOZLODUY N-PLANT SMJSC	Kozloduy	3	1.2
12	AMV-AGRO LTD	Plovdiv	3	1.2
13	DENDRIT LTD	Sofia	3	1.2
14	ZEOREX INTERNATIONAL SMLTD	Sofia	3	1.2
15	YONTEH LTD	Sofia	3	1.2
16	NEOCHIM JSC	Dimitrovgrad	3	1.2
17	SKGT-ELECTROTRANSPORT JSC	Sofia	3	1.2
18	NIHFI JSC	Sofia	3	1.2
19	EUROCONSULT LTD	Plovdiv	3	1.2
Total (19 companies)		10 cities	102	40.5
Others (131 companies)		28 cities	150	59.5
Total all (150 companies)		**38 cities**	**252**	**100.0**

Source: Based on data in the Official Journal of the Bulgarian Patent Office, 2012.

To boost the innovative and patenting activity of the Bulgarian economy it is crucial to **raise awareness** on issues concerning the protection of intellectual property, including inventions. Because of the lack of patent literacy a large proportion of research-generated patentable products do not generate income because they have not been patented.

Research Product

New scientific knowledge is an important precondition for enhancing the country's innovation activity. An analysis of the dynamics and structure of this process reveals Bulgaria's potential to enter global scientific networks, the comparative advantages of the country in different fields of knowledge and its ability to compete successfully on the market of intellectual products.

In 2011, 3,177 publications by Bulgarian scientists were available in the SCOPUS database, which is a decrease of almost 7 % (237 articles) on the previous year. Despite changes in the number of scientific papers (alternating periods of dramatic growth and slow reduction for several years), a similar contraction with a little over 7 % was registered only between 1991 and 1992. The serious contraction of the already approved budgets of universities and public research organisations in 2010 might have caused researchers to abstain from publishing. Uncertainty among scientists in the public domain concerning their prospects for development has significantly increased.

From 1990 to 2011, the total number of scientific publications to which Bulgarian scientists made a contribution was 47,263. The work of Bulgarian scientists can be grouped in the following categories according to the scientific fields maintained in SCOPUS:

The first group with high publishing activity includes: physics and astronomy (16 % of all publications with Bulgarian participation for the period 1990 – 2011); medicine (11 %); chemistry (10 %); materials science (9 %); biochemistry, genetics and molecular biology (9 %); engineering sciences (8 %).

The second group with moderate publishing presence has a share in scientific fields in the range of 3-7 % of the total number of articles and includes: agricultural and biological sciences (5 %); mathematics (5 %); chemical engineering (4 %); computer science (4 %); pharmacology, toxicology and pharmaceuticals (3 %); earth and space sciences (3 %).

The third group with few publications comprises the remaining fields of science with 2 % or less of all articles by Bulgarian authors referenced in SCOPUS.

Throughout the period, BAS has retained its leading role in publishing. Within the higher education sector the Sofia University had the strongest positions, followed by the Medical University, Sofia; the Technical University, Sofia; the University of Chemical Technology and Metallurgy and the Plovdiv University.

In the **rating of higher education institutions in Bulgaria** half of all 12 indicators in the Scientific Research category are based on scientific publications (1 indicator, 1 % of the total rating and 5 % share within the category) and SCOPUS (5 indicators, 11.80 % of the total rating and 59 % share within the category). There are three additional indicators related to PhD programmes and three indicators on students' participation in research activities, as well as funding for research, also based on the number of students. The **weight of the Scientific Research category in the assessment remains, however, negligible** and cannot be expected to lead to qualitative development of scientific capabilities in universities. Thus, higher educational establishments in Bulgaria risk remaining at the level of secondary vocational schools churning out employees for the corporate sector, rather than being places for the generation and dissemination of new knowledge. Important **categories of indicators**, which reflect an essential part of the research and innovation activity of universities and have an impact on the qualification of students **have not been taken into account**:

- advancement of academic staff;
- participation of academic staff in research;
- implemented projects (including those financed by private sources, from the National Science Fund at the Ministry of Education, as well as from European funds and framework programmes, and from research programmes under bilateral cooperation);
- participation in transnational scientific networks;
- joint research with other universities, research institutes or business, participation in clusters;
- presence of scientific schools;
- applicant and patent activity, private and acquired intellectual property and contracts for their joint use;
- proprietary/shared research infrastructure;
- participation in regional/European infrastructure facilities;
- successful examples of academic entrepreneurship.

The omission of such important areas of contemporary research and the use of a single database for the assessment of publishing activity is distorting; it undermines the role of university science and somewhat misleads the users of the rating system.

Thus, **the rating system does not support the preparation and implementation of policies for the development of quality higher education in the country** and improvement of the competitiveness of Bulgarian universities. The lack of proper evaluation system of universities and scientific organisations and their research activities is a major shortcoming of educational and scientific policy in Bulgaria. Bearing this in mind, the Regulations for the Evaluation of Scientific Work, prepared by the Ministry of Education, Youth and Science should be finalised and implemented without further delay.

Entrepreneurship

Entrepreneurship is one of the binding elements of the national innovation system. It is embodied in newly-established companies and is the means of interaction and exchange of information, know-how and technologies among stakeholders in the innovation economy. Entrepreneurship is crucial for both the robustness and adaptability of the national innovation system. A spirit of enterprise and a culture of innovation should underlie the objectives of national innovation policy.

National Economy as an Environment for Entrepreneurship

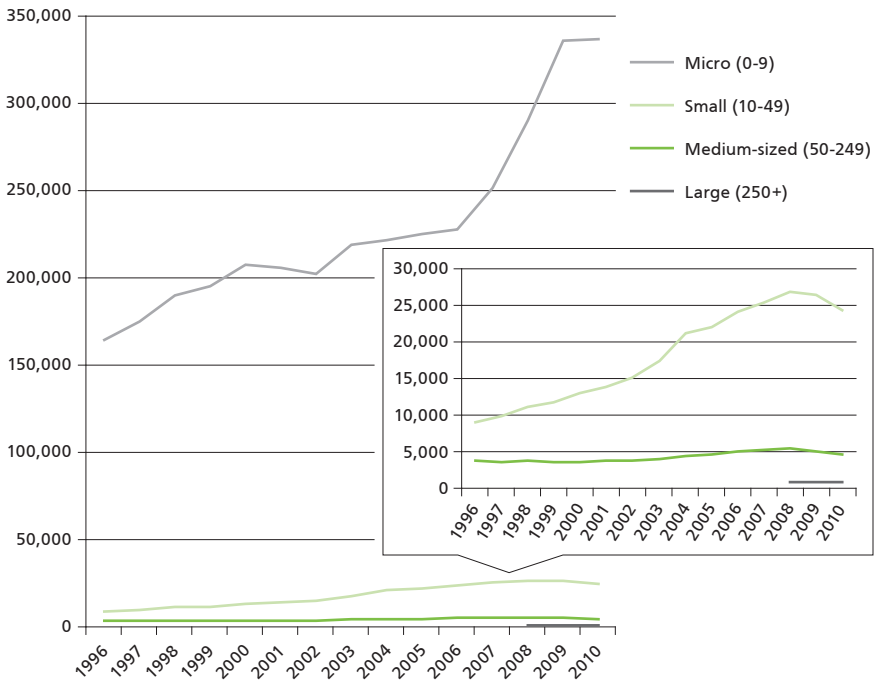
In everyday practice, entrepreneurship in Bulgaria is usually associated with the establishment of new businesses (a new business enterprise), but in the past decade the dominant economic schools have adopted the concept that the establishment of new companies is not entrepreneurship if these new companies follow 'established combinations' which contribute to the reproduction of the existing technological and economic model. In this sense, the structure and dynamics of enterprises in terms of number and size can be perceived as reflecting only the context in which innovation-oriented entrepreneurs put their ideas into practice.

The continuing global financial and economic crisis is undoubtedly one of the reasons for the reversal of the ten year growth trend in the number of enterprises in the non-financial sector in Bulgaria. This reversal is most obvious in the case of small, medium-sized and large enterprises (of which there are fewer) while the number of micro-enterprises continued to increase at a rate of 15 % for a second year. The rising number of micro-sized enterprises was also the reason for a rise in the total number of enterprises in the non-financial sector in 2009. In 2010, the number of small and medium-sized enterprises dropped by about 8 % compared to the preceding year, which was also **the largest year-on-year decline** for the period since 1996. The same rate of decline by 8 % year-on-year was also recorded in the case of large enterprises but for an earlier year– in 2009 – when this trend was not so tangible for the other enterprises.

The shift in 2009 – 2010 had a varying impact on the sectors and enterprises according to their size. Even in 2009, the number of large enterprises shrank in many sectors, including in those which reported a growth in numbers of enterprises as a whole thanks to the newly-established micro and small enterprises. **In 2010, the total number of non-financial enterprises increased by an average 2.5 percentage points compared to the previous year but entire sectors shrank**. The two leading sectors – D – "Power Generation, Natural Gas and Steam Supply and Air Conditioning" grew by 66.8 % and A – "Agriculture, Forestry and Fishing" – nevertheless maintained their positions, while the "Construction" sector recorded the largest reduction on an annual basis of all sectors (-9.2 %), followed by "Manufacturing" with -5.7 %. The increase in the number of enterprises in the sectors with the highest positive growth in 2010 resulted from newly established micro enterprises, while the decline in the sectors with negative growth was mainly due to small and medium-sized enterprises – and in construction to a reduction of nearly 1/3 in the number of large enterprises.

These trends are also confirmed by the existing data about the life-cycle of enterprises for the period 2004 – 2009. Nearly one-fifth of active enterprises in every year of that period were newly born – i.e. the average annual growth rate was slightly over 19 %.[19] Most were new enterprises, which did not employ staff, essentially meaning that the 'enterprises' were self-employed individuals who classified as micro-enterprises. These constituted 67.6 % of enterprises in 2009,

Figure 7. NUMBER OF ENTERPRISES IN THE NON-FINANCIAL SECTORS OF THE ECONOMY BY YEAR AND ENTERPRISE SIZE



Source: NSI, 2012; Statistical Yearbooks 1997 – 2008.

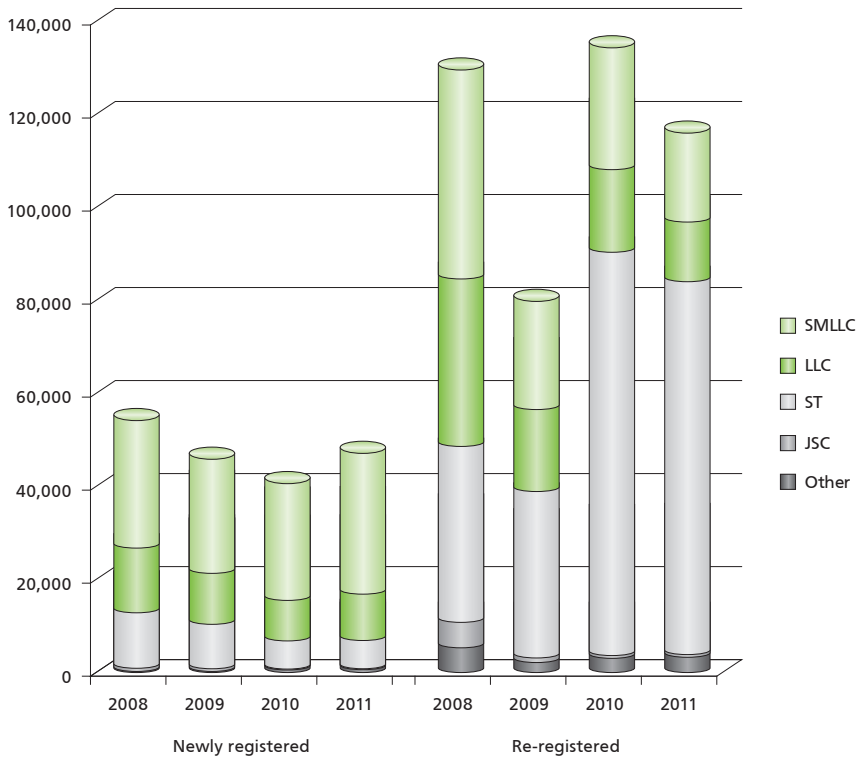
[19] Business Demography (at 31 December 2009), NSI 2010.

while businesses with 10 or more employees, i.e. small, medium-sized and large in total, were only 2.1 % of all newly formed enterprises that year. The share of enterprises that survived the entire five-year period was slightly over 6.8 % for the entire economy, the bulk of the surviving enterprises being in sector K – "Finance and Insurance" (11.6 %). The smallest proportion of enterprises survived in sectors L – "Real Estate" and D – "Power Generation, Natural Gas and Steam Supply and Air Conditioning", both having less than 3 %. In spite of the lack of data about the life-cycle of businesses after 2009, on the basis of the dynamics of the number of enterprises in the non-financial sector for 2008 – 2010 it can be assumed that in 2010 and 2011 the high share of micro-enterprises was maintained among new businesses, but that the share of those that survived over a five-year period will have declined even more because of the effects of the crisis and the shrinking of entire sectors such as construction and manufacturing. Abrupt regulatory changes in the sector of renewable energy sources will probably lead to a further shrinking of enterprises in the energy sector.

The negative trend of predominance of micro- and small enterprises, including the 50 %-plus share of enterprises without employees, in the Bulgarian economy is expected to continue after the crisis. At the same time, data about the structure and dynamics of the form of business ownership show some positive trends, the first signs of which were observed in 2010. In 2001, the dynamics of start-up enterprises compared to re-registered businesses showed that in terms of ownership **limited liability companies** continue to be the preferred form.[20] Single member limited liability companies amounted to between 50 % and 63 % of all newly established companies in 2008 – 2011, their share increasing with each consecutive year.

As expected, easier procedures for establishing a company adopted in 2009, in particular, the reduction of the required initial capital at the registration of commercial companies, as well as easier access to (and online provision of) subsequent accounting services, led to rising shares of other forms of ownership compared to sole traders and cooperatives. **This change is important in the long term as it leads to a change in the economic culture of owners because of the separation of company ownership from property of persons**. This is the beginning of an important transition from the petty ownership mentality in Bulgaria, since the view of ownership as an economic resource which – given some risk taking – can generate profit lies at the basis of an enterprising culture.

Figure 8. STRUCTURE OF LEGAL PERSONS REGISTERED IN THE COMMERCIAL REGISTER BY FORM OF OWNERSHIP AND BY YEAR



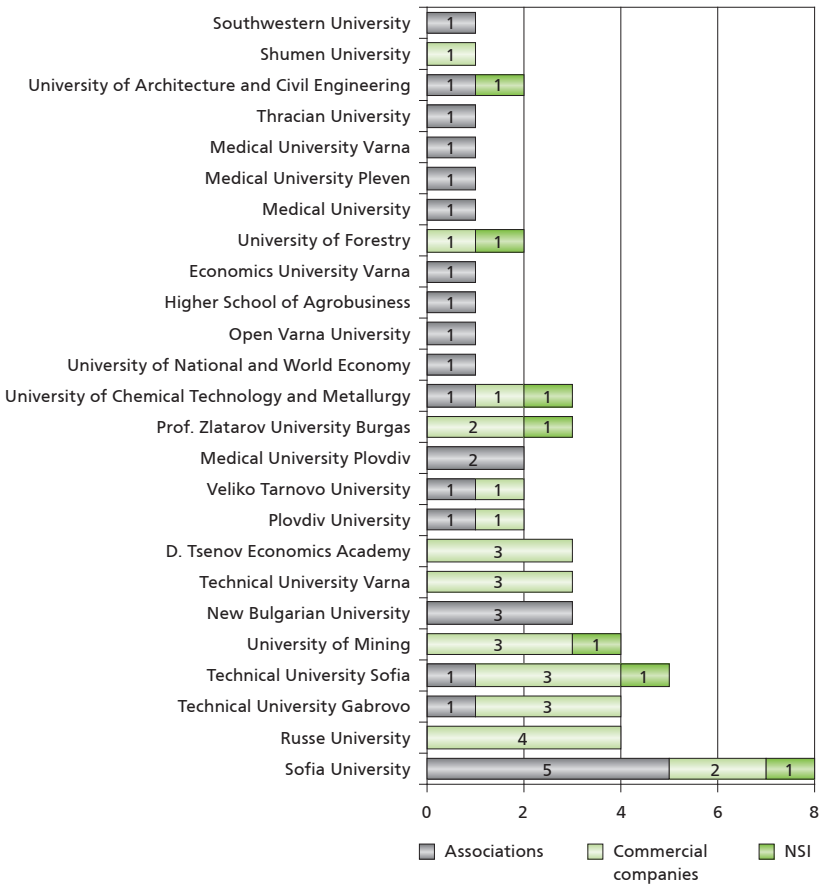
Source: Registry Agency, 2012.

[20] *Innovation.bg 2011*, p. 30.

Entrepreneurship and Commercialisation of Research at Universities

Over the past 20 years or so, the process of commercialisation of scientific results by publicly financed research organisations has been plagued by one main weakness: **the contacts between business and science – varied and in many of the cases informal and hidden – are either ineffectively or not at all institutionalised**.[21] The main outcome of this is lack of sustainability and effectiveness even in cases of innovative entrepreneurship which had been successful from a technological or economic point of view. Even economic sectors, the backbone of which was created by academic entrepreneurship after 1989 – such as the ICT sector or, to a lesser degree, pharmacy and machine-building – **still lack institutionalised and sustainable practices of commercialisation of R&D results**. The mediator infrastructure – such as technology transfer centres at some of the universities and BAS, business incubators (independent or part of R&D organisations) and patent offices – which was established mostly over the past decade and which should promote and support these processes **remains mainly project-oriented**.

Figure 9. UNIVERSITIES AND NUMBER OF AFFILIATED LEGAL PERSONS (EXCLUDING PUBLISHING HOUSES AND REGIONAL BRANCHES)



Source: Commercial Register, 2012; BULSTAT Register, 2012.

On the one hand, these organisations fail to supply real market-based mediator services and on the other – in many cases demand for such services is lacking because of **the lack of enterprise among scientists, researchers and the management of R&D and academic institutions**. A survey of the 25 largest universities in terms of lecturers under employment contract shows that only in isolated cases do universities engage in entrepreneurship by establishing and participating in business enterprises targeted at commercialisation of R&D results.[22]

Apart from a publishing house – typical for nearly every higher educational establishment – examples of engaging in such activity are commercial corporations such as the Joint Genome Center (JGC) – a joint enterprise of Sofia University and the Agricultural Academy's AgroBioTech Park LTD., three commercial corporations with the participation of the Technical University of Gabrovo, two commercial corporations each of the Russe University, the Varna Technical University, the University of Mining and Geology and the D. Tsenov Academy of Economics, and one commercial corporation each of the Technical University Sofia[23] and the Prof.

[21] In *Innovation.bg 2010* it was noted that in Bulgaria "a variety of hidden interactions between the research and business spheres is widespread, in which scientists and researchers are engaged in entrepreneurial activities. This could involve spin-off creation, scientists and researchers moonlighting between an institute and a business enterprise or providing consultations and expertise to business enterprises, cooperation in the development of human resources, cooperation in national and international applied research projects, etc. The common feature of all these forms of interaction is that they are informal, sometimes using loopholes in or even breaching the law. Thus, they remain hidden from both official statistics and most surveys in this area." (*Innovation.bg 2010*, p. 39).

[22] The survey includes data about the legal persons registered in the Commercial Register and the BULSTAT Register, as well as information about the number of employees according to NSSI.

[23] The Technical University in Sofia is also partner in another commercial corporation, but according to the publicly accessible information in the Commercial Register and NSSI it is not operating although it has several employees.

Zlatarov University in Burgas. These commercial corporations are usually 100 % owned by the universities, which – under the Law on Small and Medium-Sized Enterprises – makes them affiliated enterprises. This restricts their access to European and national funds since the percentage of co-financing is very high and universities usually cannot raise it.

A **specific form of entrepreneurship** popular among universities is **the establishment of unincorporated partnerships**, set up under the Law on Obligations and Contracts mostly for R&D, education and training but which only in isolated cases directly commercialise R&D results. Preference for this legal form of association is due to the easier administrative and accounting requirements; at the same time, they are also less transparent and have lower requirements for reporting compared to commercial corporations.

Unincorporated partnerships are not growth-oriented, but their efficiency is determined by other, sometimes non-market factors, unlike classical spin-off companies where the rate of growth is definitive for potential profit. It should be noted that some of these partnerships have a relatively long history and have operated as successful teams for proposal writing and project implementation in a particular field for years. In addition, seven of these universities have so-called **R&D sectors** set up as separate legal identities in their structure. This sector traditionally engages in management and support of fundamental and applied research financed mainly by external sources and to a very small degree from own resources, including a special university budget subsidy item titled 'Relevant Research and Creative Activities'.[24] There are also centres for technological transfer at some universities albeit not always existing as independent legal persons; as mentioned above, they are mainly project-oriented and do not have the transfer of technologies from science to industry as a central feature of their business model.

The lack of focus on the commercialisation of research results produced by the universities and, respectively, the lack of related support for academic enterprises are also evident in the fact that ICAR OOD, a limited liability company established in 1998 with partners including 20 of the most popular universities, the Ministry of Education and two private companies, with the objective of "establishing business contacts between the creators of R&D products and their consumers, as well as economic activity" was liquidated in 2011.[25] This first attempt by the Ministry and the leading universities to institutionalise this kind of activity failed and although frequent appeals for such initiatives have been made over the subsequent years, such opportunities have not yet emerged. Support for academic enterprise by the Ministry of Education, Youth and Science has been mainly in the form of project financing by the National Science Fund.

[24] According to a study by the Applied Research and Communications Fund, in 2007 – 2009 three public universities – Sofia University, the University of National and World Economy and the Technical University – Sofia – used less than 3 % of their state subsidy to this end, in spite of the fact that the law entitles them to up to 10 %. However, there are no comparable data specifically for the R&D expenses of the universities because the relevant item in the state subsidy refers in aggregate to "relevant research and creative activities and the publishing of textbooks and academic works". (See Ordinance No. 9 of 08.08.2003 concerning the Conditions and Procedure for Planning, Distribution and Expenditure of Funds Earmarked by the State Budget for Scientific or Creative and Artistic Activity Inherent to State Higher Educational Establishments, SG, No. 16/2008, amended SG No. 74/2009, effective 01.01.2010)

[25] When this company was established it was commissioned with all activities typical of the process of commercialisation of research results, including: "assisting higher educational establishments in the development of scientific and applied research studies; conducting applied research studies; technology and R&D product transfer, including initial production, establishment and organisation of the functioning of small enterprises; financing, crediting and implementation of engineering projects" etc. (Articles of Association of ICAR OOD, Article 3, source: Commercial Register 2012).

Investment and Financing for Innovation

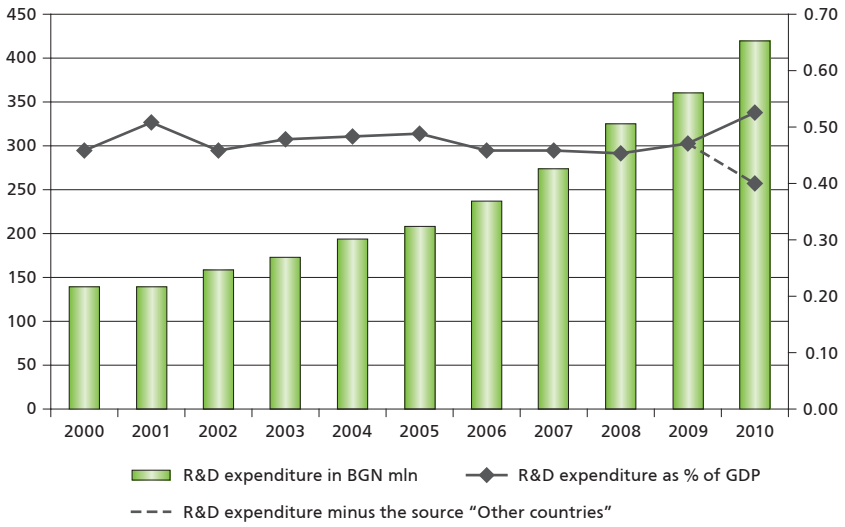
Spending on R&D and innovation is a measure of the investment in the creation, use and dissemination of new knowledge in the public and business sectors. It is an indirect indicator of the innovation capacity of national economies. High R&D intensity as proportion of GDP is a factor fostering dynamic economic growth and competitiveness.

R&D Expenditure

In the second edition of Innovation Union Scoreboard 2011,[26] **Bulgaria holds an absolute record** with a 4.4 % rate of change in the indicators studied over a period of five years. With this result, the country ranks first not only in the group of the modest innovators,[27] but also outstrips the leaders in the other three groups: Malta and Portugal with a growth of 2.5 % in the group of moderate innovators, Cyprus, Estonia and Slovenia with a growth of 2.4 % in the group of the innovation followers, and Finland which is representative of the innovation leaders with 1.0 % growth. **One of the main reasons for Bulgaria's success**, along with the applications for trademark registration (70.3 %) and industrial design (76.9 %), whose growth is several times larger than the growth in all other indicators and for all countries included in the study, is the **increased expenditure for R&D in the Enterprise sector** by 25.7 %.

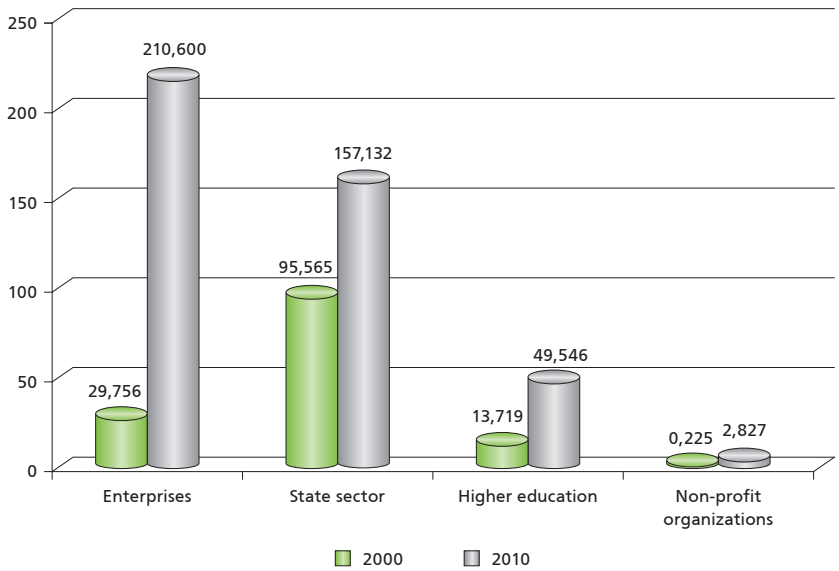
The reason for the country's high performance in this area is largely due to the two-year lag before R&D data are included in the European Commission's strategic documents. Analysis of the existing data showed that business increased investments for research and development until 2009, after which **a considerable decline of nearly 36 % on an annual basis was registered in 2010. The funds forming the rise in expenditure for R&D in 2010 nearly all have other countries as sources**.[28] Funds from abroad invested in research and development in Bulgaria increased fivefold – from BGN 30,264,000 in 2009 to BGN 165,519,000 in 2010. A mere 11 % of these funds were invested in the state sector and higher education. The rest of the funds were invested in projects implemented by businesses and NGOs.

Figure 10. R&D EXPENDITURE IN BULGARIA



Source: Own calculations based on NSI data, 2012.

Figure 11. R&D EXPENDITURE BY INSTITUTIONAL SECTORS, BGN MLN



Source: Own calculations based on NSI data, 2012.

[26] Innovation Union Scoreboard 2011, The Innovation Union's performance scoreboard for Research and Innovation, 7 February 2012.

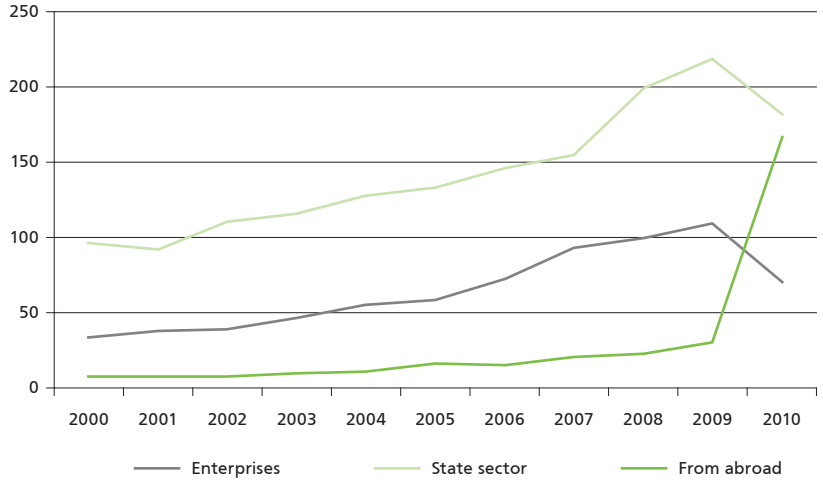
[27] See further the Innovation Product section of this report.

[28] Since this is a matter of one source, NSI does not provide information which source it is. What is referred to is probably financing under the European Regional Development Fund.

Along with the reduction of expenditure for R&D by enterprises (-36 %), the decline in 2010 compared to 2009 can also be seen in the other sectors considered a source of investment in R&D: the state sector (-17 %), higher education (-23 %) and non-profit organisations (-39 %). If the level of funds for R&D from other countries by the indicator of "R&D expenditure as % of GDP" for 2010 had remained the same as in 2009, Bulgaria would have registered a decline of up to 0.4 %, which is lower than the conservative forecast for 0.5 % made in the previous edition of the report *Innovation.bg* (dotted line in Fig. 10). In this sense, if there is **a change in national R&D financing** in 2010 (without taking into consideration the funds from abroad) it is a **decline to the lowest level in the last 20 years**. Considering that the budget forecast for 2013 – 2015 does not envisage growth for the next three years, an essential change in the ratio with a view to achieve the national objective of 1.5 % GDP in 2020 could hardly be expected.

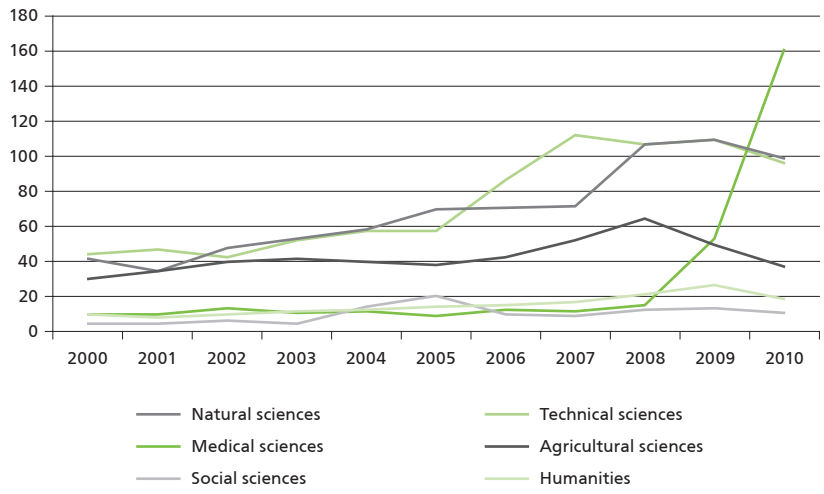
After the year 2000, the share of the funds invested in R&D coming from other countries in all R&D investments in Bulgaria varied between 0.05 % and 0.08 %. For the first time in 2010, as a result of the more limited capacity of enterprises and organisations based in the country and the 547 % growth of funds for R&D from abroad, this share reached 40 %, or over one-third of all expenditure for research and development of economic agents in Bulgaria. This is almost as much as the contribution of the state sector (43 %) and far above the share of enterprises (17 %) and higher education (0.5 %). Given the substantial and abrupt change in the data, a detailed analysis focussing on the statistical methods of reporting that were used is needed in order to avoid any suspicions that the change is only in accounting and does not reflect real business processes.

Figure 12. R&D EXPENDITURE BY SOUCRES OF FINANCING, BGN MLN



Source: Own calculations based on NSI data, 2012.

Figure 13. R&D EXPENDITURE BY SCIENTIFIC FIELDS, BGN MLN



Source: Own calculations based on NSI data, 2012.

The capacity of the state, the enterprises and the higher educational establishments to invest in long-term growth based on new technology and innovation was diminished by the financial and economic crisis and its consequences in the 2010 – 2012 period – financial restrictions, conservative policy of credit institutions, inter-company indebtedness, the state withholding payments in procurement contracts and the contraction of markets were all negative factors. This, in combination with the limited opportunities for risk financing, the absence of business angels and the problematic absorption of funds under OP Competitiveness, placed innovation-oriented units in an exceedingly complicated situation.

The change in the proportion of R&D current expenses (93 %) compared to the expenditure for the acquisition of fixed assets (7 %) was also unfavourable for 2010, the last

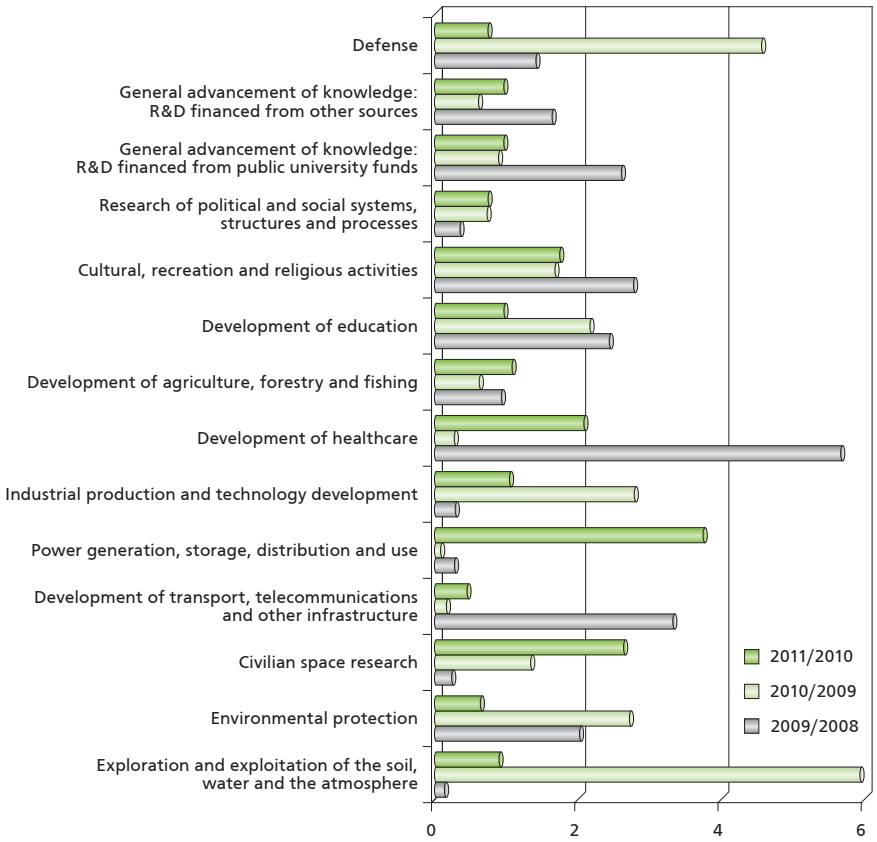
year for which data are available. The non-governmental sector registered only running costs; higher educational establishments limited investments in fixed assets intended for R&D to 17 %, and their share in enterprises and the state sector was brought down to 6 %. Compared to the preceding year (2009), the share of running costs increased by 6 percentage points. In this way, the structure of R&D expenditure by type approached pre-2003 levels. When this figure is compared to business trends for 2000 – 2010, it can be seen that the structure of R&D expenditure was more unfavourable only in 2002. In other years, expenditure for fixed assets did not fall below 10 %, reaching a maximum share of 34 % in 2004. Essential improvements in 2011 and 2012 could hardly be expected, although there are indications of slight recovery after a trough was reached in April 2010.

The share of the funds invested by organisations in their own research and innovation projects was relatively similar in different sectors – 80 % in the state sector, 82 % in business and 83 % in higher educational establishments, with a much lesser role for joint projects and R&D results generated by commission from abroad. Lack of interest in officially institutionalised and reported joint research is evident yet again in the latest NSI survey of company innovation.[29] **Only 22.4 % of companies making technological innovations report some form of collaboration with other companies, research institutions or partners.** Almost half (44.5 %) are large enterprises (250+ workers) for whom close contacts with partners along the technological chain is customary.

[29] Company innovation in the period 2008 – 2010, NSI 2012.

[30] Pursuant to the Law on Higher Education and Ordinance No. 9 of 8 August 2003 regulating government spending on research and creative work by public universities.

Figure 14. GOVERNMENT BUDGET OUTLAYS BY SOCIAL AND ECONOMIC GOALS, Y/Y GROWTH, %



Source: Own calculations based on NSI data, 2012.

Box 3. COFINANCING OF THE BULGARIAN PARTICIPATION IN PROJECTS IMPLEMENTED UNDER EUROPEAN PROGRAMMES FOR RESEARCH AND INNOVATION

Bulgaria's participation in EU **framework programmes for research, development, and innovation** is mandatory, and strongly encouraged for other programmes promoting the development of science, technology, and innovation. The framework programmes cover between 50 and 75 % of the total budget of project. The rest must be provided by national financing schemes – either centrally, through the various national instruments or institutionally, according to the institutional background of the applying team of researchers. Various practices have emerged in the different member states but each has put in place schemes to ensure the national co-financing component.

In Bulgaria, the matter of co-financing of projects under the 7th Framework Programme has been resolved by a specific scheme under the National Science Fund, which was introduced in 2007. **In the latest World Bank report on the state of innovation in Bulgaria, the scheme was defined as good practice**. It is still necessary to address the issue of national support for projects financed under other European programmes, including COST, EUROSTARS, and EUREKA. **One possible solution could be the establishment of special schemes under the National Innovation Fund or the Operational Programmes in the next programme period**.

Source: MEYS, 2012.

Slightly over 57 % of the funds which higher educational establishments have for their "relevant" research are public funds (which amount to 15 % of state expenditure for R&D), another 17 % are provided by business (or 12 % of the funds businesses set aside to this end). The funds earmarked for relevant research and creative activities at the universities have plummeted.[30] There is also a tangible decline in the budget of the National Science Fund compared to 2009 and 2010. The second facility for national project funding – the National Innovation Fund – has practically not functioned for three years now.

The reduction of expenditure for R&D in 2009 and 2010 is a trend across all scientific fields with the exception of medicine where a nearly 11-fold increase was observed for 2010 in comparison with 2008. In 2010, public funds had a prevalent share in the development of agricultural, social and humanitarian sciences. **In the case of technical sciences, businesses set aside nearly twice as much for R&D than does the state**, which yet again confirms the argument put across by previous editions of *Innovation.bg* about the need for better synergy between private and public financing in the fields of science and technology.

In 2000 – 2010, agricultural sciences were affected by the most substantial changes (from ranking second by priority to technical science with 30 % of the total funds invested in R&D in 2000, to a mere 9 % of the expenditure for R&D in the country ten years later), followed by **medical sciences** (from 7 % in the total R&D expenditure in 2000 to 38 % of all funds spent in 2010) **and technical sciences** whose share declined by 9 percentage points. Changes in structural terms are almost lacking in the other fields of science. The exceedingly sharp fluctuation of budget expenditure for R&D by social and economic targets does not support positive trends and does not prevent negative ones. On the contrary, **state financing of research and development is fragmentary without long-term vision or substantiation** of government policy in the field of science and innovation.

Box 4. BULGARIA'S PARTICIPATION IN THE SEVENTH FRAMEWORK PROGRAMME FOR RESEARCH, DEVELOPMENT, AND INNOVATION

The 7th Framework Programme is the third in which Bulgaria has been involved as a full member. In the time between the start of the Programme in 2007 and February 2012, 2,355 eligible applications have been submitted, involving a total of 3,014 participants. This constitutes barely 0.9 % of all projects submitted within EU-27. The funds applied for amount to nearly 0.55 % of the total for EU-27 and ranks Bulgaria 20th by contribution requested. The proposals with Bulgarian participation have had a 17.2 % success rate versus 21.2 % success on average across the EU.

In the period in question, 403 project proposals (518 participants) have been approved for financing and 375 contracts have been awarded. In this respect Bulgaria ranks 23rd by success rate and 25th by amount of financing received. Compared to the same period for the previous framework programme, there has been a decline in these indicators.

In terms of the areas covered, Bulgarian researchers have been most active in the thematic area of Information and Communication Technologies, followed by Environment, and Foods and Biotechnologies. Bulgaria also had good positions in the areas of research for the benefit of SMEs and Scientific Infrastructure.

The participation of the different Bulgarian institutional sectors has been balanced. Scientific research organisations, universities, and businesses have had relatively equal shares. As was only to be expected, public and other organisations have been weakly represented.

Source: MEYS, 2012.

Financial Instruments in Support of Entrepreneurship

Access to credit is a key condition for entrepreneurship. According to NSI data, in 2007 – 2010 over three-quarters of Bulgarian SMEs have sought some form of financing. Worldwide, a number of specialised financial instruments focused on supporting the implementation of innovative enterprising ideas have been established. In Bulgaria, after the country's accession to the EU the Union funds have been the most significant instrument in terms of quantity. Within OP Competitiveness there are **six sub-priorities, the funds under which are channelled towards support of innovative enterprise**.

An agreement for the application of JEREMIE between the Bulgarian government and the European Investment Fund was signed in 2010, aimed at the establishment of financial engineering instruments intended for start-ups and support of existing innovative micro, small and medium-sized enterprises. Five funds for financing SMEs were established under the agreement:

- A fund providing commercial banks with guarantees to finance SMEs with own resources;
- Three equity funds – a venture capital fund providing funding for innovative small start-up enterprises, a Growth Fund to support start-up SMEs in the first years after their establishment and the so-called Mezzanine Fund for mixed equity and loan funding;
- Entrepreneurship Acceleration and Seed Financing Instrument supporting entrepreneurs for proof-of-concept testing and development of a business plan for its implementation.

In this way, **a full range of capital instruments focused on each stage of the life-cycle of an innovative enterprise is introduced in Bulgaria through OP Competitiveness** – from the development of the concept, through a start-up enterprise and early development to capital expansion and expansion of the business at a mature stage. The European funds and the national budget total slightly more than BGN 389 million. The conditions for the functioning of the funds require that each fund should also attract external financing. According to preliminary estimates of MEET from the end of 2011, the total funding for SMEs should amount to nearly BGN 1 billion. **Although the funds from OP Competitiveness are reported as absorbed, only the Guarantee Fund is actually operational to date.** The latter was launched in September 2011 and should finalise its operation after 30 months.[31]

In addition to the existing international and national venture capital funds, some leading companies or individual entrepreneurs in separate sectors like ICT have also become established in recent years. These operate as micro-funds or as business angels, providing financial and expert support for start-up enterprises. The Sirma Young Spirit initiative of Sirma Group, one of the leading IT companies in Bulgaria, is an example of the former. It offers seed capital – i.e. investment at the earliest stage of development of a concept – to young entrepreneurs in the field of ICT. The investment in IventGames (a company of three young entrepreneurs who developed a game for Sony PlayStation) made by one of the owners of another large IT company in Bulgaria, Gramma Net IS, is an example of the latter, the Bulgarian Business Angel Network mediating to connect the two.

The increasingly popular initiatives of multinational and Bulgarian companies **to announce calls for innovative projects on a competitive basis** are a specific form of support, including providing financing for entrepreneurs. In many cases, in addition to the award, these initiatives also act as mediators connecting entrepreneurs with potential investors such as venture capital funds or business angels.

Other than the priority axis providing funds under JEREMIE, the absorption of funds under the remaining priority axes remains low, the disbursed funds under each not even reaching the level of the national financing the country invests in the budget of the operational programme.

As a share of the total budget of the OP, paid funds to date amount to 24.9 %, but if the funds reported as paid under JEREMIE (which, however, are still inaccessible to business with the exception of the BGN 150 million in the Guarantee Fund) are subtracted then the share of actually paid funds drops to 9.5 % of the total OP budget, which is equal to 63 % of national co-funding. In other words, **in spite of official declarations about innovation being a priority of public policy, the government and the legislature still fail to create adequate conditions for the Bulgarian economy to avail itself of the financial resource of OP Competitiveness**.

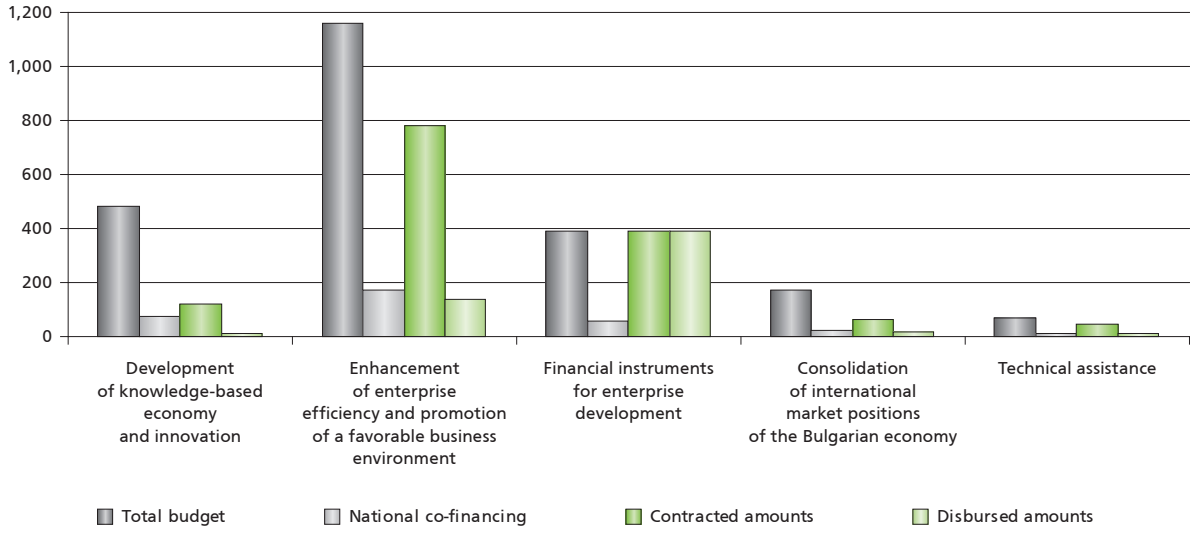
[31] The fund has some BGN 150 million which serve as guarantee for another nearly BGN 800 million that the participating banks have to provide as loans for SMEs. A total of five banks have signed agreements with the Guarantee Fund. The conditions include facilitation such as lower amount of collateral from borrowers (by up to 50 %), reduced interest (about 2-3 % on average compared to the standard conditions of the banks) and lower or no fees. Information about the interest on the part of SMEs in these credits is still insufficient, but according to initial data from the banks it is lower than expected in the first months.

Table 3. INITIATIVES IN SUPPORT OF ENTREPRENEURSHIP, 2010 – 2012

Initiative	Organiser	First Prize	Sector
National			
Sirma Young Spirit	Sirma Group Holding	Seed capital for the earliest stage of concept development	Young entrepreneurs in IT
Empower award for exceptional young entrepreneurs	Empower United Foundation	BGN 100,000 and consultancy for development of an enterprising concept	All sectors
NOVATech Competition – for technological entrepreneurship and innovative business ideas, part of the global Intel Global Challenge at UC Berkeley	Bulgarian Institute for Management and Technology (BIMT) in cooperation with the Bulgarian Association of Software Companies (BASSCOM) and Vassil Velichkov, Manager of Gramma Net IS	$20,000 for the winner at regional level in CEE and participation in the global finals at Berkeley, California	ICT, energy, nanotechnology, biotechnology
Startup Weekend Sofia	Startup Weekend Global – individual entrepreneurs and leading figures in high-tech companies, mainly in IT and venture financing	Programme for practical training for technological and non-technological entrepreneurs	Mainly ICT, but without formal limitations
IT Leader Academy	Faculty of Mathematics and Informatics at Sofia University and Musala Soft	A course of practice, business and applied science oriented lectures and discussions presented by leading figures from multinational and Bulgarian IT companies	ICT
Junior Achievement Bulgaria	Junior Achievement Worldwide and its regional chapter Junior Achievement – Young Enterprise Europe	Various programmes, competitions and awards for young entrepreneurs in the field of technological and social innovation	All sectors
International			
Cisco I-Prize Global Innovation Contest	Cisco	$250,000 and complete access to Cisco – Cisco collaboration solutions	ICT
IBM Global Entrepreneur Initiative	IBM PartnerWorld	Three-year support for young companies (up to 3 years) through a programme for free technological support at development of software products with IBM, Amazon Web Services and Novell technologies	ICT
"Start with e-innovation" competition for the best idea for online business start-up	Allegro Group, CEE online trade company	The first three ranked share a total prize of €10,000 for the development of their projects. The first prize amounts to at least 50 % of the quoted sum.	ICT
Global Impact Competition (for Central and Eastern Europe)	Singularity University (initiative of Silicon Valley companies and NASA)	Covering all costs for participation in the summer training programme of Singularity University worth $30,000 (for the 2012 competition the winner can choose and use Autodesk software worth $10,000). The quest is for innovative ideas that may improve the life of 1 million people over a period of 3 years by using all possible technologies	All sectors, but with a stress on ICT
*info*Dev Top 50 innovative, technology-led small to medium enterprises (SMEs)	*info*Dev, World Bank, within a joint programme with the government of Finland and Nokia called Creating Sustainable Businesses in the Knowledge Economy	– covering costs for participation in *info*Dev initiatives such as the Global Forum on Business Incubation; – presentation and introduction to potential financing institutions, global technological companies, business angels, etc.	All sectors

Source: Applied Research and Communications Fund, 2012.

Figure 15. BUDGETED, CONTRACTED AND PAID OUT RESOURCES UNDER OP COMPETITIVENESS, IN BGN MLN



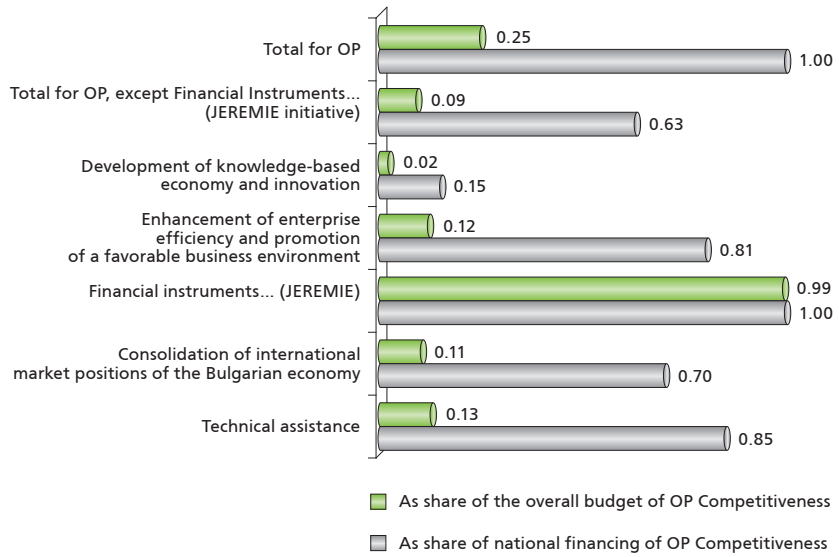
Source: Unified Information System for Management and Monitoring of the Structural Instruments of the EU in Bulgaria (UMIS), as of 15.04.2012.

As regards contract implementation, less than a third of approved projects (31.9 %) under the operational programmes were completed successfully, while 22.9 % of the projects – or one in every five – have been terminated. Nearly BGN 2 million[32] has been paid under these and has yet to be reimbursed by the beneficiaries. The reasons for the termination of projects should be sought in **the persistent structural defects since the launch of the programme,** mostly caused by the administration, but also by the contractors. Project approval and implementation have been plagued by red tape and a number of other problems:

a) **delay at every stage of the functioning of the operational programme** – from the approval of the annual indicative programmes and calls, through the evaluation of projects and conclusion of contracts, to the intermediate payments and audit of results, all of which cause problems with the absorption of the funds, the provision of co-funding (including through credits), implementation of the planned activities on time and interaction with foreign partners;

b) **frequent changes in statutory instruments** many of which are made retroactively – from instructions about a certain call or answers to questions asked, to decrees of the Council of Ministers, which lead to a change of conditions under contracts for ongoing projects, requests for reimbursement of expenses

Figure 16. DISBURSED AMOUNTS BY PRIORITY AXES AND TOTAL FOR OP COMPETITIVENESS, %



Source: Unified Information System for Management and Monitoring of the Structural Instruments of the EU in Bulgaria, as of 15.04.2012.

[32] By 15 April 2012 these amounted to BGN 1,942,456 according to UMIS.

incurred according to the statutory instruments before the revision, retroactive repeal of official decisions for the approval of activities and results, and so on;

c) **a high level of red tape** – this is most clearly visible when project results are reported and undergo auditing. There is a lack of knowledge, skills and experience in the public administration with regard to business processes, administrative management and reporting of projects.

Against this backdrop, responsibility for the implementation of the operational programme shifted from the Small and Medium Enterprises Promotion Agency to the Ministry of Economy, Energy and Tourism in 2012. This change had potential to speed up procedures, but also to lead to deterioration of the quality of approved and financed projects. One conclusion from the experience accumulated so far is that no administrative rules can replace **good faith policy and practices** – constant concern and attention of the government for the effective work of the public administration and the application of contemporary management practices for motivation and control.

Human Capital for Innovation

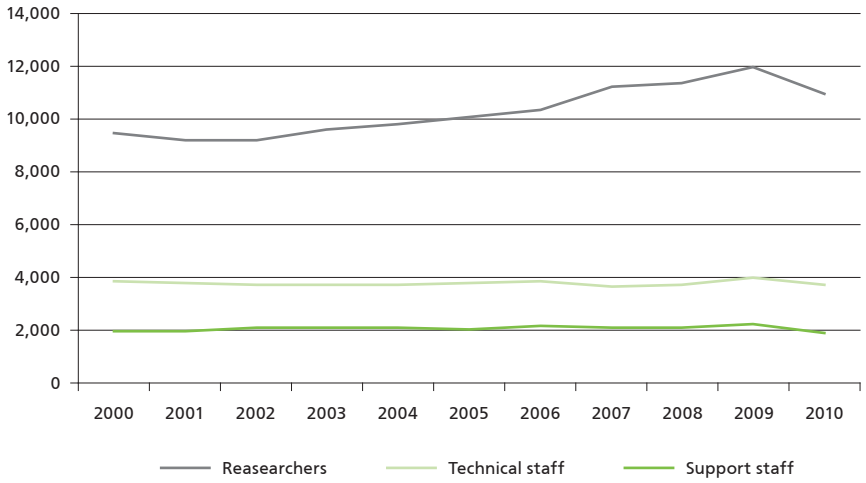
A picture of the personnel engaged in R&D, including academic and technological activity, reveals the level of human resources available for the creation, application and dissemination of new knowledge in the field of technologies. Employment in high-tech sectors reveals the country's specialisation in areas with a high level of innovation activity.

Personnel in the Fields of Research and Technologies

The economic crisis has a considerable negative effect on the number of personnel engaged in R&D. After a long period of growth, the latest data from 2010 show a **decline in the number of staff engaged in R&D, with a particularly pronounced decline for supporting staff** (-14 % compared to 2009). The proportion of foreign citizens employed in research and development varies between 1.5 % and 2 %. Most of them come from countries outside the EU.

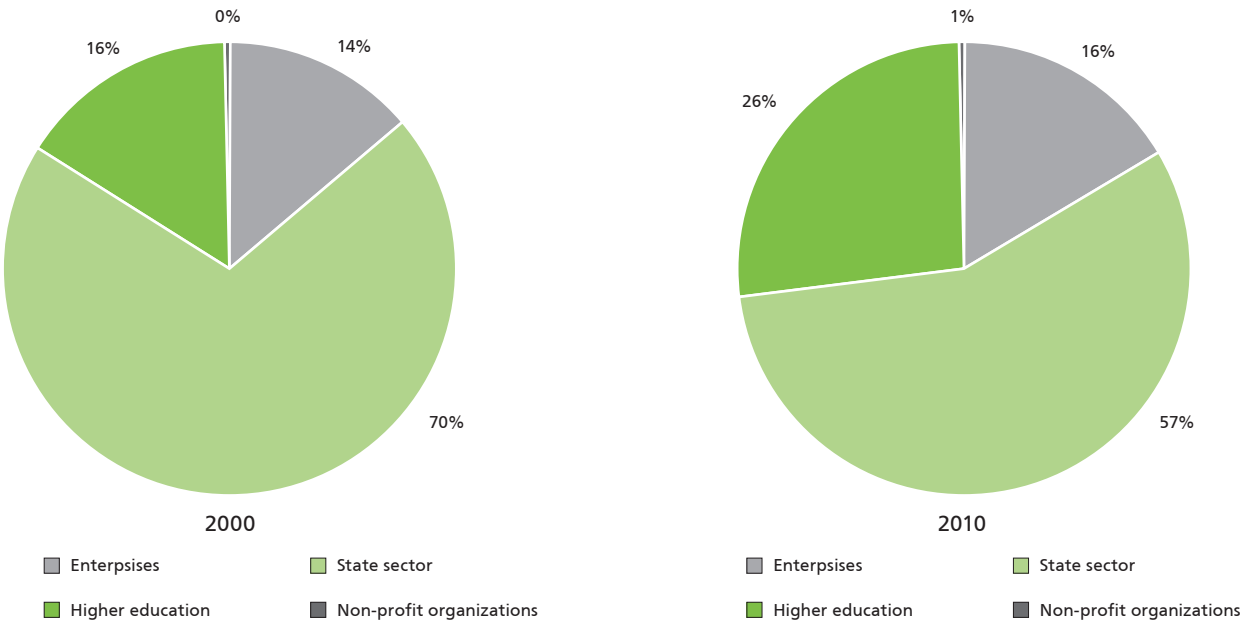
The **ageing** of R&D personnel continues. The age structure of staff engaged in R&D in the state sector and higher educational establishments is identical. In 2010, the largest share was that of research staff in the 55 – 64 age bracket (29 % in both sectors), followed by staff aged between 45 and 54 (respectively 28 % for the state sector and 26 % for higher education). Those engaged in R&D aged between 25 and 34 have an equal share of 16 %. There are some differences in the dynamics in the last five years. While the largest increase in the state sector is among R&D staff aged 35 – 44 (4 percentage points higher in 2010 compared to 2005), in higher education the

Figure 17. NUMBER OF PERSONNEL ENGAGED IN R&D, BY CATEGORY, IN FULL-TIME EQUIVALENT



Source: NSI, 2012.

Figure 18. SHARE OF R&D STAFF BY INSTITUTIONAL SECTOR, 2000 AND 2010, %



Source: NSI, 2012.

largest increase of those engaged in R&D is registered for people over 55 (7 percentage points), mainly at the expense of the lower age category between 45 and 54 years (a decline by 6 percentage points).

A year-on-year increase of personnel engaged in R&D for 2010 compared to 2009 took place in:

- Natural sciences (9 %) despite 10 % cuts in financing;
- Agricultural sciences (5 %) against the backdrop of 25 % cuts in R&D financing;
- Humanities (3 %), which is in effect a 6 % decline, recalculated in full-time equivalent, and corresponds to a 31 % reduction of funds for R&D for this field.

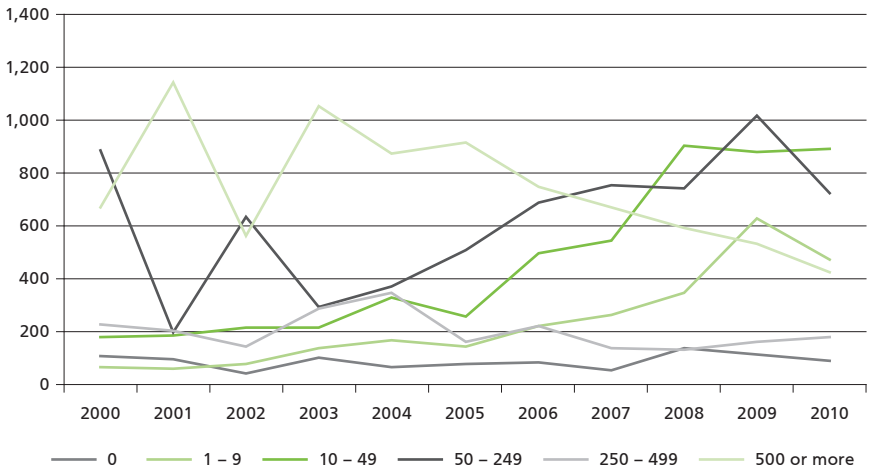
The 6 % reduction of the number of employees engaged in R&D in the field of medicine (equal to a 16 % decline in full-time equivalent) does not correspond to the increase in funds for research and development in this field, which increased three-fold. In sectors where growth could take place during and after the crisis, such as medicine, there has been an increase of labour productivity. The crisis can be expected to lead to a decline in productivity and further contraction of activity in fields, which rely mainly on state financing and do not have a market presence.

There is a correlation between personnel and financing in the case of **technical sciences**, where there has been the largest decline in employment (20 %), accompanied by lower financing by 12 % – a fact which, however, draws the country further away from the objectives of the Europe 2020 strategy with regard to the opportunities for increasing the innovation potential of the economy and effectively introducing Bulgarian know-how or expertise attracted from abroad.

Considerable improvement (approaching European standards) is registered in the **institutional affiliation of the personnel engaged in R&D** in 2010 compared to 2000. The change is due to the increase in the number employed at enterprises (1.4-fold), higher educational establishments (2.4-fold) and the non-governmental sector (2.1-fold) and, to a lesser degree, to the decline in the number of staff engaged in research and development in state sector units (just 15 %). These data confirm that the significant restructuring of R&D potential in the different sectors – from the academies at higher educational establishments, NGOs and the private sector – made the structure of state funding increasingly inadequate over the past decade.

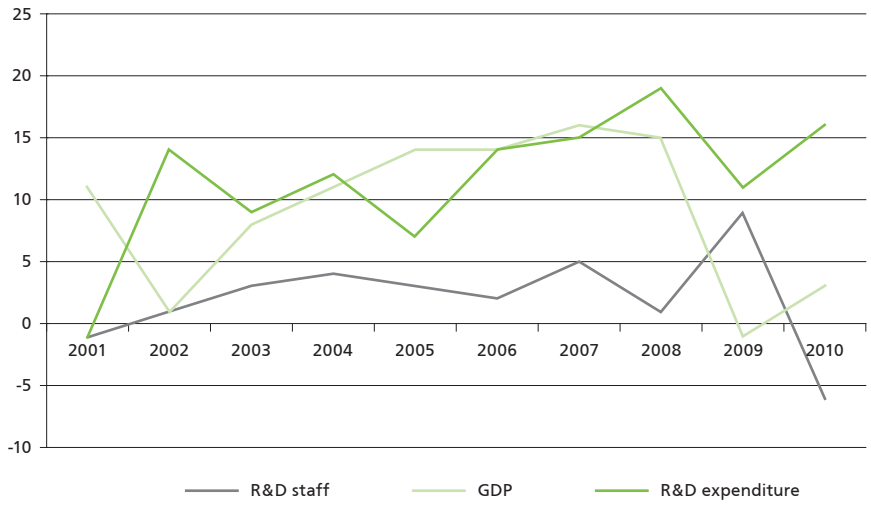
The distribution of personnel by sectors, however, considerably deviates from the share of absorbed financing. While 50 % of the funds for R&D in 2010 were absorbed by business, this sector employed just

Figure 19. NUMBER OF PERSONNEL ENGAGED IN R&D, IN FULL-TIME EQUIVALENT, IN SECTOR "ENTERPRISES", BY SIZE OF ENTERPRISES



Source: NSI, 2012.

Figure 20. GDP, R&D EXPENDITURE AND R&D STAFF, ANNUAL GROWTH RATES, %



Source: NSI, 2012.

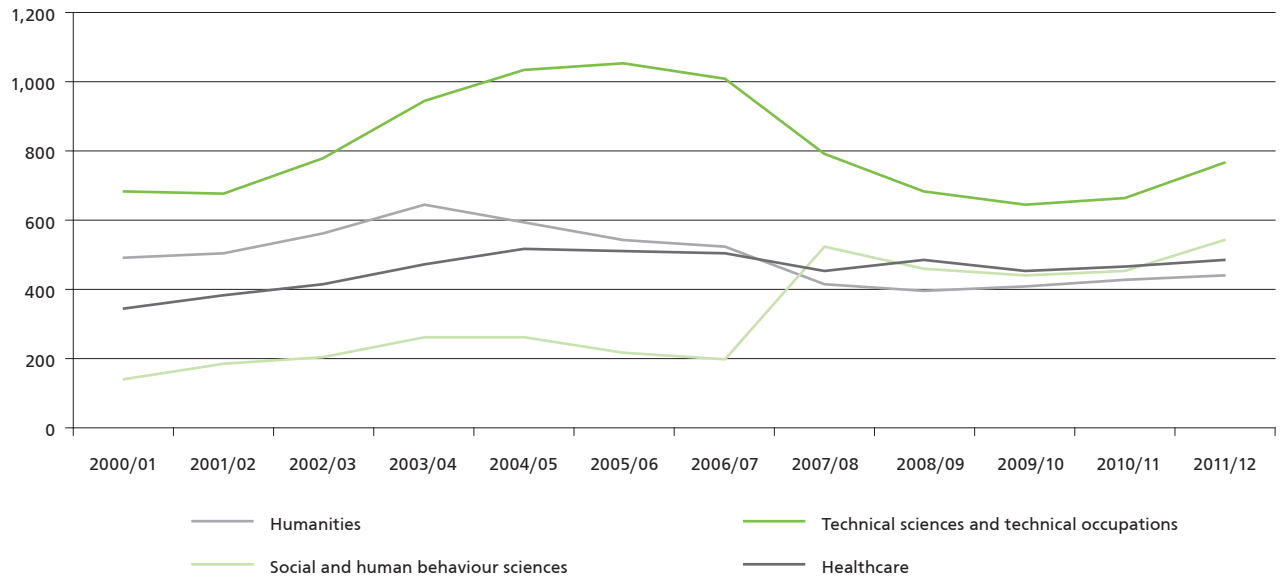
16 % of personnel. **Higher educational institutions attracted 37 % of the staff engaged in R&D in the country, but provided a mere 12 %** of the expenses for science and education. The result is low productivity and devaluation of the work of academic staff, as well as lack of motivation to raise the quality of research (measured in number of articles with impact factor, frequency of citation, patent activity, mobility, the state of research infrastructure and opportunity for equal participation in joint international research projects) and to improve educational activity (updated curricula, discrepancy between the needs of business and the training of specialists, the state of educational premises). Further **refocusing from teaching to research** is necessary in universities in order to better utilise the potential of R&D personnel.

The trend of declining numbers working in R&D at enterprises with a 500-plus payroll (-26 %) continued in 2010. Micro-enterprises registered the same change (-26 %), as did medium-sized enterprises (-35 %). There was a slight growth in the remaining groups of enterprises. As a whole, the trend of reduction in the number of personnel engaged in R&D in the business sector is more distinctive than the trend of declining number of enterprises, particularly in the case of those with up to 9 employees. It can thus be said that small enterprises prove to be the most stable in respect to R&D employment in a period of crisis. This is not surprising, considering that R&D employment in small companies (10 – 49 employed) usually included a team of highly-qualified associates who usually have a strongly developed sense of mutual responsibility and trust.

Training of Researchers

In the 2010/2011 academic year, post-graduate students undergoing training in the third stage of higher education increased by 245 and reached a total number of 4,095 – a positive trend valid which was seen across all fields of education with the exception of the arts (-5 %) and environmental protection (-24 %). On an annual basis the largest increase of doctoral students was registered in the fields of journalism, mass communication and information (49 %); land, sea and air transport management (31 %); mathematics and sta-

Figure 21. NUMBER OF STUDENTS PURSUING DOCTORAL DEGREE BY NARROW FIELDS OF EDUCATION



Source: NSI, 2012.

tistics (26 %) and economic sciences and administration (20 %). **The interest of students in journalism is most persistent**, with a nearly nine-fold increase compared to the academic year 2000/2001. **Over the entire period, there has been a prevalence of doctoral students** in the technical sciences and technical occupations (16 % of all doctoral students in the 2010/2011 academic year); healthcare and social and human behaviour sciences (11 %) and humanities (10 %).

There is a discrepancy between GDP growth and the indicators for financing and human resources in the field of research and development:

- The growth of funding for R&D in 2010 which corresponded to the growth of GDP was actually fuelled by sources external to the national economy (See section *Investment and Financing for Innovation)*;
- The total number of engaged in R&D changed quite dynamically after 2000, which does not correspond to a policy of research staff recruitment and development aimed at achieving long-term goals and in this sense should be more conservative in respect to the changes in the state of the market;
- The changes in the number of personnel engaged in R&D do not correlate with changes in financing for research and development, which can be accounted for by attempts at increasing labour productivity in the private sector.

Information and Communication Technologies

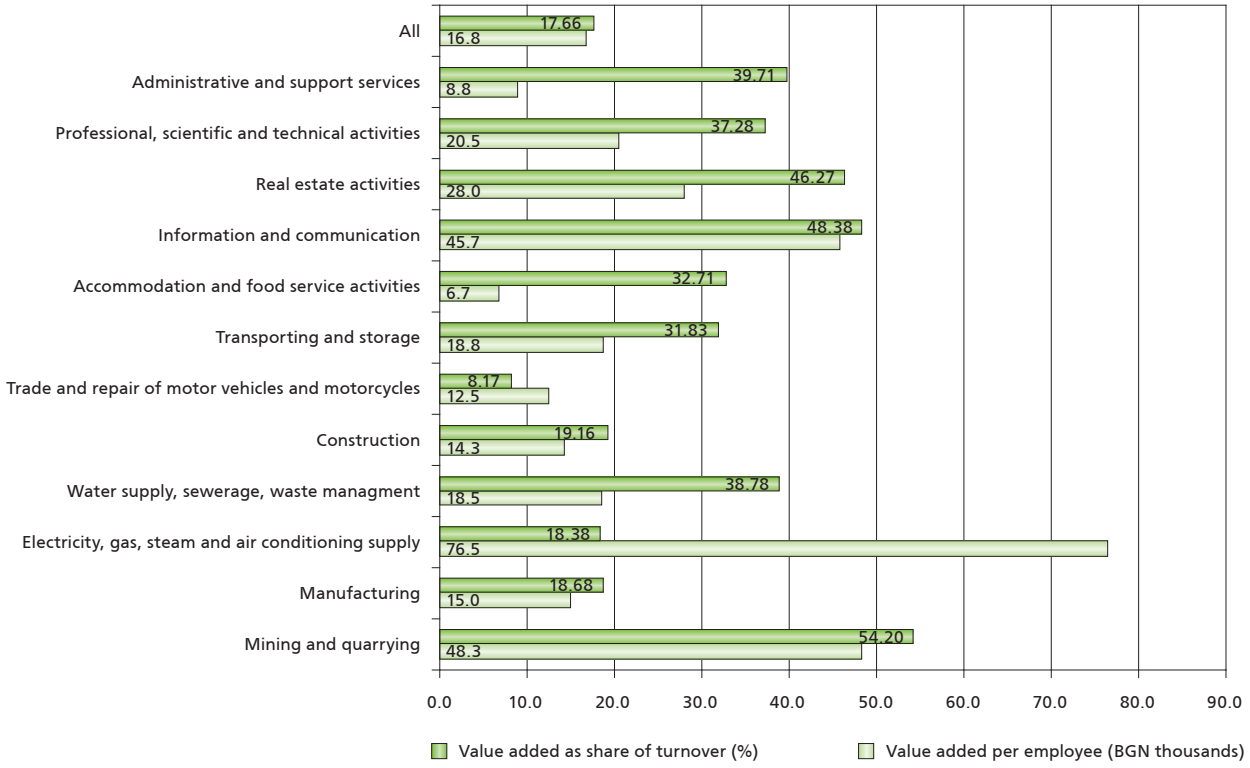
[33] Information and Communication Technologies: Part of the present analysis has been developed under the project "Analysis of the current state and identification of innovation development trends in the field of ICT" implemented in the period October 2011 – February 2012 with the financial assistance of the Bulgarian-Korean ICT Coordination Center at Sofia University.

The ICT Sector in the National Economy

The business sector of information and communication technologies (ICT)[34] is of key importance to the growth and innovation of the Bulgarian economy. **In 2010, the value added per employee in section J, "Information and communication" (BGN 45.7 thousand) was nearly three times the national average (BGN 16.8 thousand)**. The only sections with higher value added per employee were sections B, "Mining and quarrying" (BGN 48.3 thousand), and D, "Electricity, gas, steam and air conditioning supply," (BGN 76.5 thousand).[35] In the future, however, the latter two are less likely to grow in value added because of the high capital intensity, great indebtedness of enterprises, the need to meet environmental standards and improve working conditions and the fact that they are already nearing their maximum production capacity.[36] The productivity of sector I, "Accommodation and food service activities" (which, in the form of tourism, has been declared a priority sector for the country and is expected to generate growth), was lowest (BGN 6.7 thousand), while section C, "Manufacturing," displayed lower than the country average value added (BGN 15 thousand) and thus ICT emerges as the incontestable leader in terms of prospective growth.

Export of ICT sector products continued to increase in 2011 albeit at a slower rate compared to 2010, according to data from foreign trade

Figure 22. ECONOMIC ACTIVITY BY NACE-2008 SECTIONS, 2010



Source: Own estimates, Structural Business Statistics, NSI, 2012.

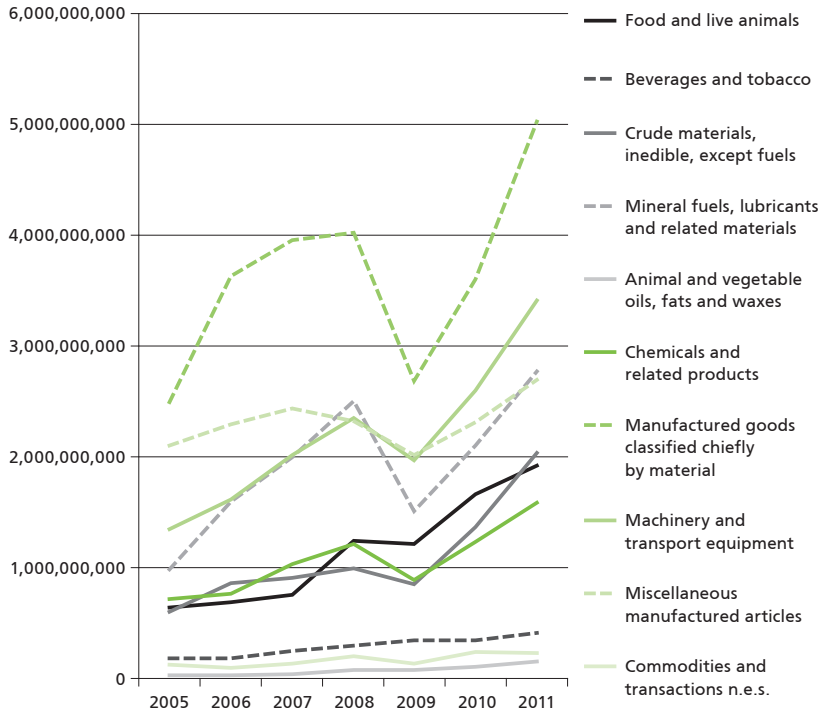
[34] According to NACE 2008, the ICT business sector is defined as a combination of division 26, Manufacture of computer, electronic, and optical products, and section J, 'Information and communication', which comprises the following divisions: Publishing activities (58); Programming and broadcasting activities (60); Telecommunications (61); Computer programming, consultancy, and related activities (62); and Information service activities (63).

[35] Additional sector-specific information on competitiveness and innovation in the construction and energy sectors (as important consumers of the output of the mining industry), as well as on the energy sector as a separate industry is available in *Innovation.bg 2011: Innovation policy and Sector Competitiveness*, ARC Fund, 2011, pp. 47-74.

[36] Bulgaria occupies leading positions in the mining and export of many metals, at least on a regional scale, and owing to the rising prices of raw materials, the mining industry will continue to account for an important share in the country's exports. The company ranking second by turnover in Bulgaria for 2010 was Aurubis (Pirdop) with BGN 3.8 bln. The first one was Lukoil Neftochim with BGN 5.5 bln. A significant increase in sales volumes of Aurubis can only be expected if the price of copper rises on the international markets because the company is currently operating at nearly maximum capacity.

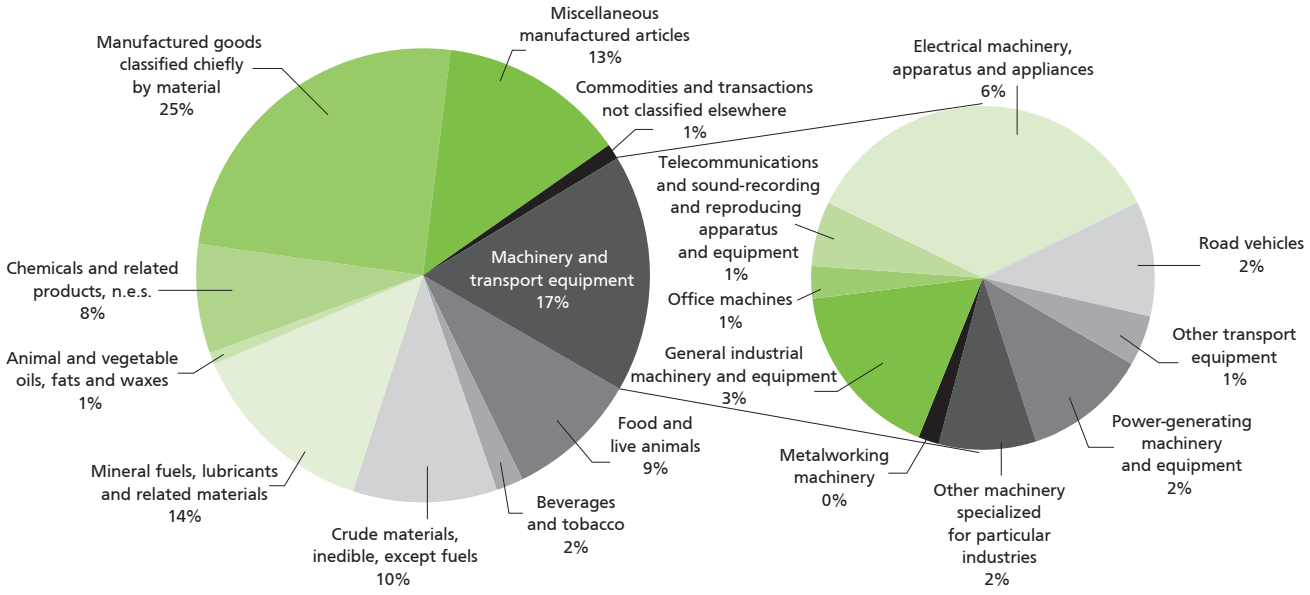
statistics.[37] After significant growth of 34 % was achieved in 2010, in 2011 the export of 'Electrical machinery, apparatus and appliances, and electrical parts thereof' (division 77 of SFTC, Rev. 4) returned to the same annual growth rate recorded over the period 2005 – 2009 (17 – 18 %). The same trend was seen in the export of 'Office machines and automatic data-processing machines' (division 75 of SFTC, Rev. 4), which, after the remarkable 49.6 % growth rate in 2010, in 2011 went back to a level only slightly higher than its average annual growth rate in 2005 – 2009 – 21.2 %. The leaders in this product group are cash registers, manufactured mainly by two Bulgarian companies. **Investments in the sector (including in new production facilities[38]) and the contracts won for foreign markets in 2011 are an indication that growth is likely to continue in 2012** although at a slower rate.

Figure 23. EXPORTS BY PRODUCT GROUP IN THE PERIOD 2005 – 2011 (SITC, REV. 4), IN EUR



Source: Own estimates, Foreign Trade Statistics, Eurostat, 2012.

Figure 24. EXPORT BY GROUPS OF GOODS, 2011 (SITC, REV. 4)

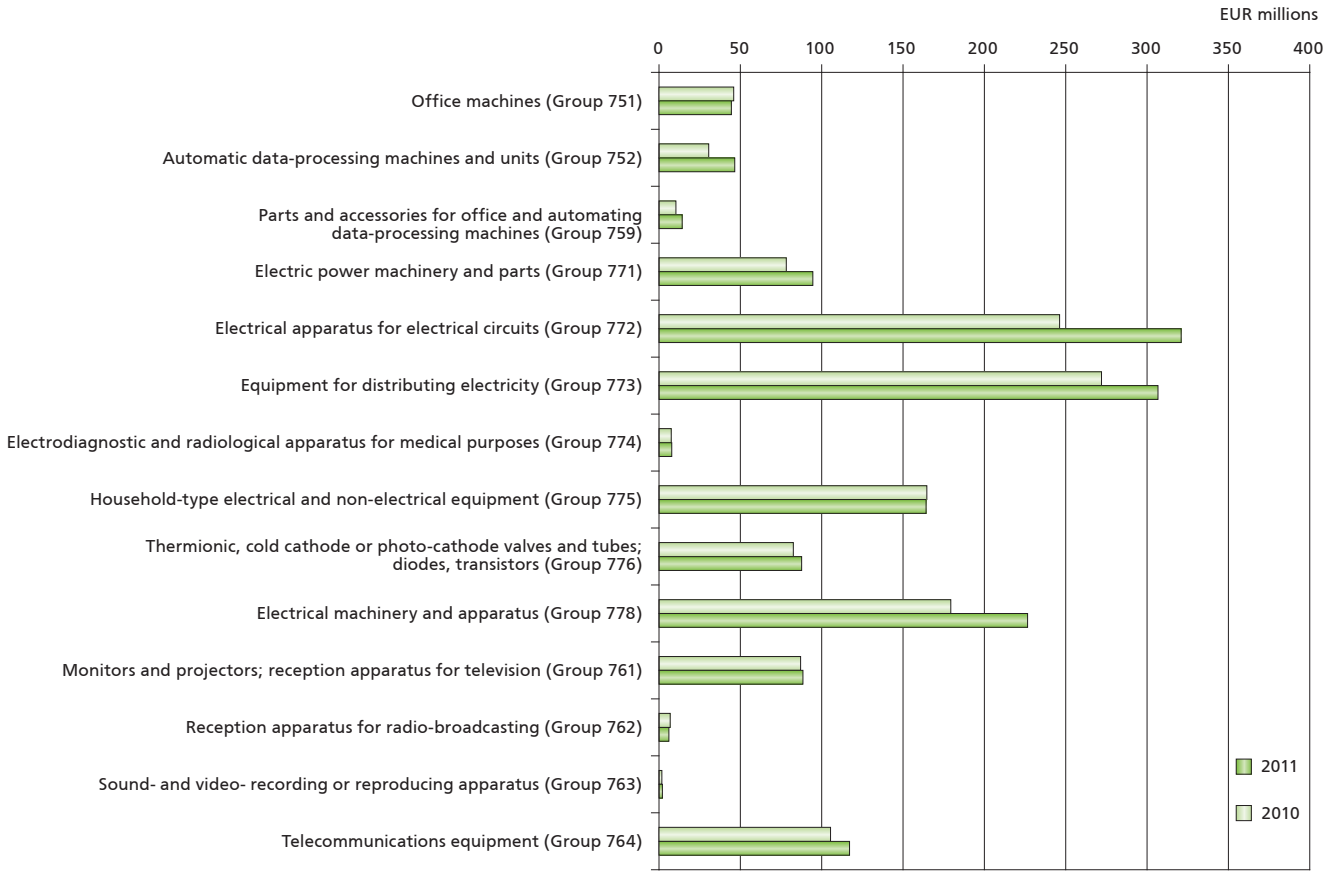


Source: Own estimates, Foreign Trade Statistics, Eurostat, 2012.

[37] The analysis is based on data from the Standard Foreign Trade Classification, Revision 4 (SFTC, Revision 4) which is the national version of the Standard International Trade Classification, Revision 4 (SITC, Revision 4) developed by the UN Statistics Division.

[38] For example, Daisy Technology has invested in a new cash register manufacturing facility in the town of Gabrovo and expects to hire 120 workers.

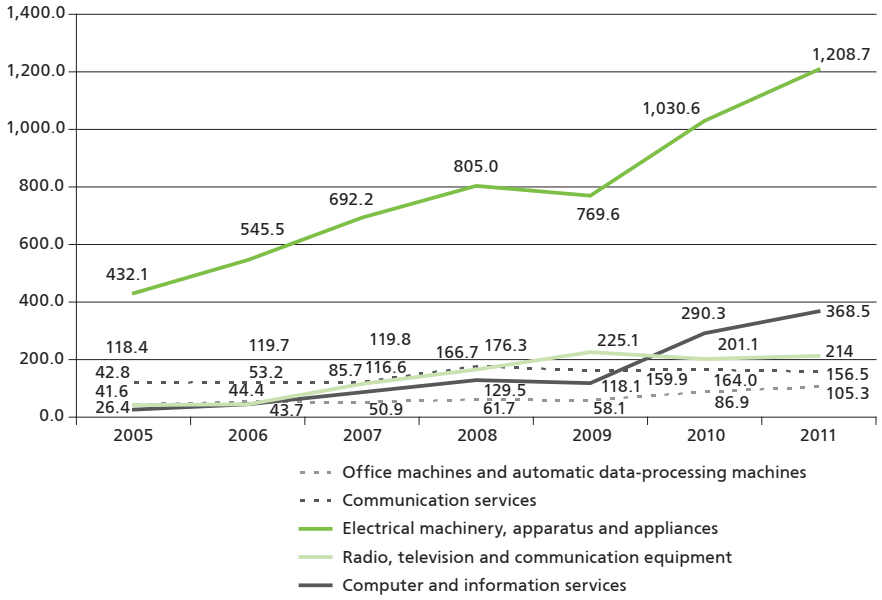
Figure 25. EXPORT OF GOODS IN SITC, REV. 4 DIVISIONS 75, 76, AND 77, 2010 – 2011



Source: Foreign Trade Statistics, Eurostat, 2012.

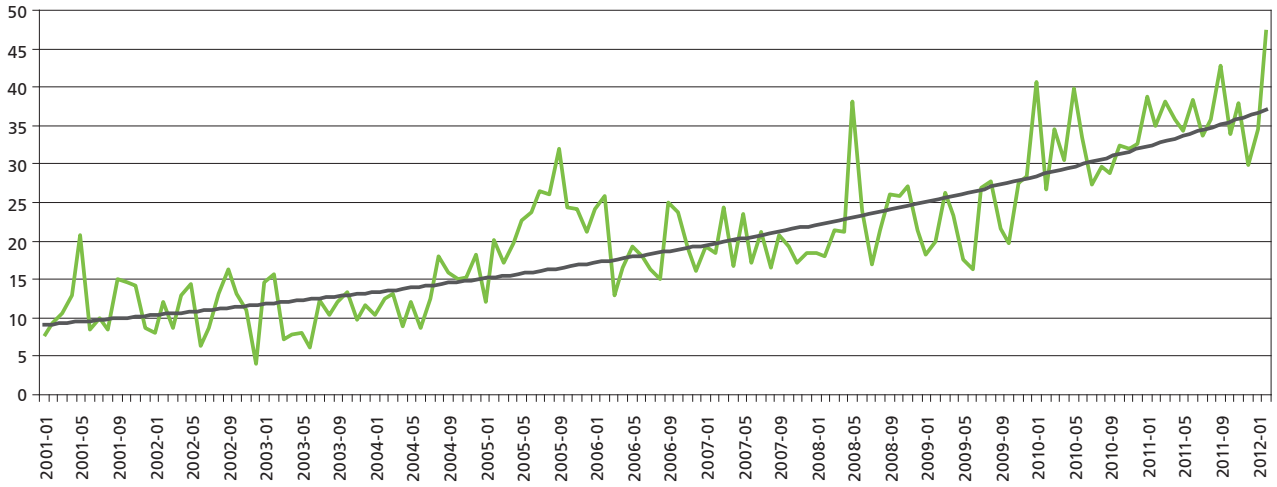
On the whole, electronics (divisions 75, 76, and 77 of SFTC) in 2010 made up about 45 % of exports in the entire group (Section 7 of SFTC). Yet growth rate in electronics export (16 %) lagged behind the general growth rate, which was 30 % for all product groups. Slightly more than half of the exports in division 77 ('Electrical machinery, apparatus and appliances, and electrical parts thereof') were accounted for by the subgroups 772 ('Printed circuits, electrical resistors other than heating resistors, electrical apparatus for switching or protecting electrical circuits or for making connections to or in electrical circuits'), 773 ('Equipment for distributing electricity') and 773.1 "Insulated wire, cable and other insulated electric conductors." These two subgroups made up more than 60 % of the growth in division 77 in 2011.

Figure 26. EXPORT OF GOODS AND SERVICES FROM THE ICT SECTOR (SITC, REV. 4 AND BALANCE OF PAYMENTS), IN EUR MLN



Source: Foreign Trade Statistics, Eurostat, 2012; Balance of Payments, BNB, 2012.

Figure 27. SHARE OF EXPORT OF ICT SERVICES IN THE TOTAL EXPORT OF BUSINESS SERVICES, %



Source: Balance of Payments, BNB, 2012.

Within that division, 14 % of exports were accounted for by home appliances (of which 62 % were refrigerators and 16 % freezers[39]). The trend for home appliances to become ever more programmable, integrated and 'smart' is transforming them into high-tech products. Bulgaria, however, lags behind in the adoption of state-of-the-art technology and R&D in the field of home appliances and relies largely on contract manufacturing. At the same time, the Bulgarian brands serving low-end domestic demand are entirely manufactured in China.[40]

Export in division 76, 'Telecommunications and sound-recording and reproducing apparatus and equipment' was made up mainly of subgroup 761 – monitors and projectors, and reception apparatus for television (41 %) and subgroup 764 – telecommunications equipment, including apparatus for wired and wireless LAN and WLAN networks (55 %).

In 2011, for the first time the total exports of goods (hardware) and services in the ICT sector exceeded EUR 2 billion.[41] The balance of trade was negative for goods and positive for services. The export of computer and information services continued to grow at a rapid pace. In 2011, export had increased 14 times compared to 2005 and in the past year, the increase was 27 %. The share of ICT services in the total exports of the ICT sector increased from 23 to 29 % in the past 7 years, which points to improved competitiveness due to the high value added of the services. The same trend was present in the share of export of ICT services within the total export of business services. It started at 10 – 11 % in 2001 – 2003, rose to an average annual share of 36 % in 2011, and reached its all-time high in February 2012, at 47 %. As a result of this dynamic development, Bulgaria was ranked at the impressive eighth position in the world by share of business services in GDP, by preliminary data for 2010.[42]

[39] The largest manufacturer and exporter respectively, of refrigerators and freezers is Liebherr; in 2011 it employed about 1,500 workers engaged in manufacturing and about 250 people in the special unit for railway air-conditioning systems.

[40] The brands are owned by the large importers and owners of retail chains specialising in consumer electronics and home appliances.

[41] The level is still far too low, comparable with the export of Aurubis only.

[42] IMD 2011, Global Competitiveness Report 2011.

Policies to Promote Development of Innovative ICT in Bulgaria

In 2011, **Bulgaria ranked 14th among EU-27 by share of ICT goods and services exports in GDP, and in terms of foreign investments still lagged behind its immediate competitors** such as Hungary, Romania, Slovakia, the Czech Republic, and Ireland. ICT exports from Romania, Latvia, Lithuania, and particularly Estonia, grew faster than Bulgarian exports. Comparison with the other East and Central European countries shows that despite the high hopes pinned on the ICT sector in Bulgaria, and the fact that it is making relatively better progress than the other sectors of the economy, **without a decisive and tangible change in the policies supporting this sector Bulgaria cannot be expected to hold a leading position in the export of ICT goods and services in Europe.**

The largest manufacturers and exporters of electronics in 2010 in Bulgaria were Sensor-Nite Industrial, SE Bordnetze Bulgaria, Epic Electronic Assembly (at present Integrated Microelectronics Bulgaria[43]), and Melexis. A large part of the output of the sector is exported and serves the car manufacturing industry (sensors, cables, electronics[44]). **There are hardly any green-field investments; instead, the way in which innovative ICT companies enter the Bulgarian market is by drawing on existing Bulgarian resources and know-how** (e.g. BMware Bulgaria, with the Bulgarian company Sciant; Epic and Sensor-Nite – with the microelectronic plants in Blagoevgrad; Melexis – with the Interquartz Plant; SAP labs – with the Bulgarian company ProSyst, etc). This experience needs to be researched and used as a model by the Bulgarian government, especially in connection with the building up and operation of the science and technology park under the OP Competitiveness. **The priority should not be start-up investments but rather foreign direct investment into high-tech sectors to assist existing local enterprises in developing know-how and/or scientific potential in increasing their position in the international value-added chain.** Appropriate forms of cooperation need to be found, such as support for the

Box 5. POLICIES PROMOTING THE ICT SECTOR

The assessment of the value added and growth potential of the companies in the ICT sector in Bulgaria indicates that, contrary to the general opinion, all too often local companies have a larger contribution to the development of the sector than international ones. In this respect, the policies promoting ICT development must seek a delicate balance between incentives and putting in place adequate measures to enhance domestic competitiveness. In many cases the jobs created should not be taken as the sole indicator in informing policy decisions since they are not always associated with intensive R&D and innovation which is the decisive factor for high competitiveness. Thus, for instance, one of the largest companies in the sector – Hewlett-Packard Global Delivery Bulgaria Center – generates value added of 47.5 %, which is lower than the average for the ICT sector (48.4 %), while local highly innovative companies that have developed their own niche markets abroad boast considerably higher value added (e.g. Chaos Software with 73.4 %, and Interconsult Bulgaria with 65.8 %, etc).

In terms of other indicators such as average taxes paid per employee, value added per employee, etc., the comparison is once again in favour of the R&D intensive and highly innovative local and multinational companies (among them SAP Labs Bulgaria EOOD, VMware Bulgaria EOOD, Johnson Controls Electronics Bulgaria EOOD, etc.). Up to now, however, the Bulgarian government has only supported directly HP Global Delivery Bulgaria Center (by about BGN 4 million). At the same time, the presence of major multinational companies such as HP has had a positive impact on exports – both directly, through the export of services offered by the company, and indirectly, by providing the opportunity to other Bulgarian companies to win contracts for foreign markets as subcontractors or partners.[45] In terms of policy-making, this means that government support needs to be aimed at the synergetic effect of partnerships between these types of corporations and local companies, which will have a greater impact on the economy, rather than confining government assistance to direct investment in staff training which in relative terms generates lower value added.

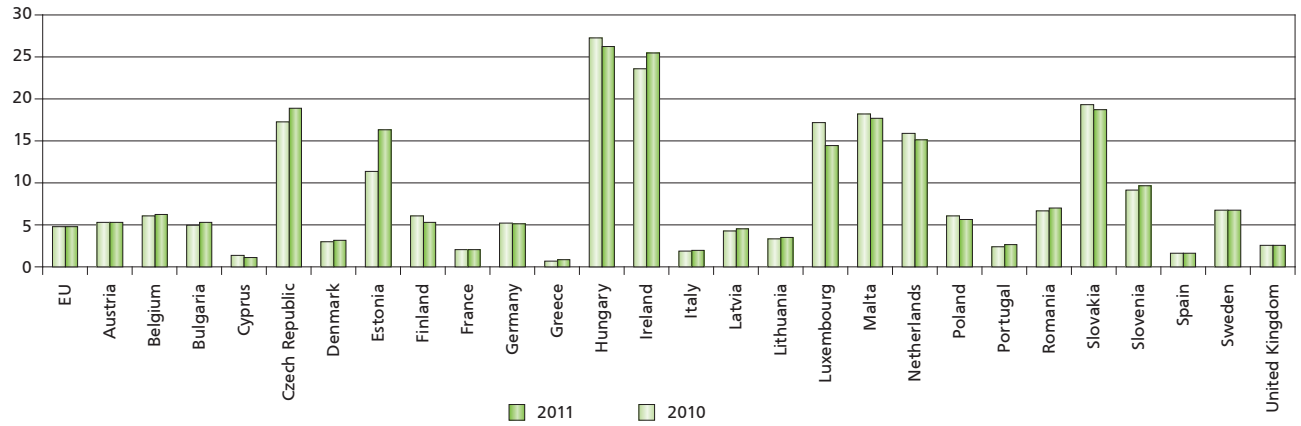
Source: Applied Research and Communications Fund, 2012.

[43] In 2010, Epic Electronic Assembly was divided up and while some manufacturing activities (automotive sensors) went over to Sensor-Nite, the rest remained with Epic in preparation of the sale to the big Filipino manufacturer IMI, with plants located all over the world.

[44] Despite the presence of other subcontractor companies working in the automotive sector – manufacturers of car seats, non-inflammable upholstery, flexible connectors (hoses), batteries, and various auto parts, there is still no reason to claim that there is a cluster of automotive manufacturers in Bulgaria.

[45] For instance, one of the most innovative companies in the Bulgarian ICT sector – Sirma Solutions, is subcontractor to Hewlett-Packard in implementing the e-government of Georgia and is responsible for the mobile component of the contract.

Figure 28. EXPORT OF ICT GOODS AND SERVICES AS SHARE OF GDP IN EU-27, %



Source: Own estimates based on Eurostat data (SITC, Rev. 4, Balance of Payments and GDP), 2012.

creation of joint ventures (e.g. Schölly-OPTIX in Panagyurishte) or incentives for attracting and expanding the R&D departments of foreign companies. Such a strategy would have positive effects on innovative serial entrepreneurs in Bulgaria and would increase the chances of the respective manufacturers in becoming world leaders in specific niche markets, at the same time as it would reduce risks associated with relocation.

Production and Productivity in the ICT Sector

According to the sample Top 400 ICT Companies[46] monitored by ARC Fund since 2006, **the ICT sector had been continuously developing up to 2010** (14 % increase in revenues and 83 % increase in profits) by hiring new workers (18 % increase) and increasing its productivity. The average number of employees per company has increased from 68 in 2006 to an average of 81 in 2010. Furthermore, 41 % of the companies had more employees in 2010 compared to 2006, and another 10 % had the same number of staff. For the companies which reduced their staff, this was related to increased efficiency (there was a steady increase in the value of the indicator 'average revenue per employee in the past 5 years' (20 %) and a trend towards increased average profit per employee) rather than lost markets. Preliminary data shows that this trend continued into the first quarter of 2012.

In general, companies that have increased their staff numbers have seen a decline in their 'profit-per-employee.' One explanation for this might be that a large number of the companies that have increased their staff are in the field of telecommunications, where the process of absorption of smaller internet providers (when some employees were duly registered by the employers) was not associated with any overall increase in revenues. On the other hand, the competition among mobile operators and the substitution of part of mobile telephony by internet-based alternatives, Skype and social networks, led to a drop in the revenues of two of the three operators, which was only partly compensated by the increase achieved by the third one. The increased average profit per employee is an indicator of ongoing processes of optimisation among the overstaffed companies.

[46] The sample has been formed based on the definition of the scope of the ICT sector according to NACE, Rev. 1.1 and has been updated in accordance with NACE, Rev. 2. In line with NACE, Rev. 2, it includes the largest companies by number of employees and by turnover from division 26, Manufacture of computer, electronic, and optical products, and the new section J, 'Information and Communication', which comprises the divisions 58, Publishing activities; 60, Programming and broadcasting activities; 61, Telecommunications; 62, Computer programming, consultancy, and related activities; and division 63, Information service activities.

Table 4. PRODUCTIVITY INDICATORS FOR THE BULGARIAN ICT SECTOR

Mean indicators per employee (BGN thousands)	2010	2009	2008	2007	2006	% change 2006/2010
Revenue from activity	188.97	188.81	191.09	195.23	197.69	95.6 %
Revenue from activity for companies with reduced staff	155.97	152.37	146.34	138.93	129.66	120.3 %
Revenue from activity for companies with increased staff	118.11	165.74	185.38	200.03	190.94	61.9 %
Profit from activity	53.65	48.59	52.06	54.58	34.97	153.4 %
Profit for companies with reduced staff	20.15	15.03	14.29	18.68	16.99	118.6 %
Profit for companies with increased staff	43.32	54.71	66.83	71.50	36.50	118.7 %
Employees	81	76	77	73	68	119.1 %

Source: ARC Fund, based on the sample Top 400 ICT Companies, 2011.

Research and Development in the ICT Sector

The official R&D statistics are not very useful for analysis of R&D processes in the ICT sector. ARC Fund estimates suggest that costs, as well as other data concerning R&D in ICT, have been significantly underestimated by NSI by between 3 to 10 times.[47]

Notwithstanding the fact that more enterprises have started submitting data (67 in 2010), many of the most innovative ones which have serious R&D activity, still do not report to the NSI. The increase by about 30 of new ICT enterprises registered in 2010 was due mostly to the Ministry of the Economy's requirements to report R&D to NSI as an instrument to prove the innovativeness of enterprises and their eligibility under the OP Competitiveness. The newly added entities generally report small staff (typically around 1 – 2 persons) and R&D expenditures that can be accounted as operating expenses for the respective year so that no taxes are due on them. An important factor for the greater accountability is the improved operation of NSI, which has started monitoring objective external factors (e.g. financing under National Science Fund or the National Innovation Fund, the innovative enterprise awards of the ARC Fund) and identifying enterprises likely to carry out R&D activity. In-depth interviews with a number of ICT and other innovative international and

Table 5. ICT SECTOR ENTERPRISES OFFICIALLY REPORTING R&D ACTIVITY TO NSI

	2005	2008	2009	2010
Number of enterprises	29	41	48	67
Number of Staff	n.a.	422	458	526

Source: NSI, 2012.

Table 6. TOTAL R&D EXPENDITURES, BGN THOUSANDS

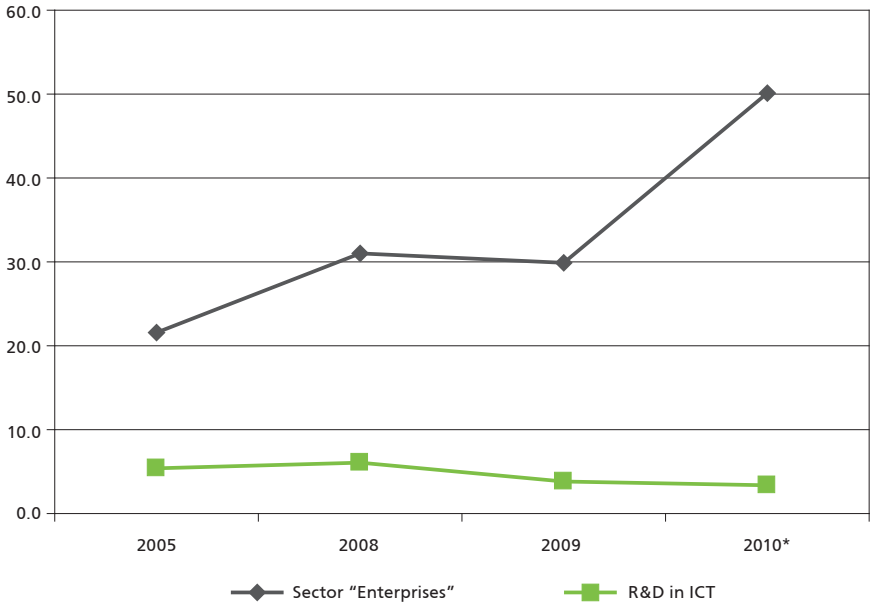
	2005	2008	2009	2010
Public sector	208,142	325,855	361,060	420,105
Enterprise Sector	44,804	101,112	108,174	210,600
ICT	11,249	19,481	14,152	13,934

Source: NSI, 2011.

[47] Cf. *Innovation.bg 2009* and *Innovation.bg 2010*.

Bulgarian companies, some of which hold patents, indicate that the main reason for not reporting to the NSI is the lack of awareness of the requirement to do so from managers and the fact that they have delegated all such functions to their accounting departments. This is problematic as the latter are often not in position to determine which costs are related to R&D and which are not. Furthermore, failure to report to NSI does not entail any sanctions. In this sense, telephone calls on the part of NSI to the companies to remind them and encourage reporting no doubt play a role. Nevertheless, what remains the strongest motivating factor are the requirements of the Ministry of the Economy, Energy and Tourism for reporting in connection with provided European funding under OP Competitiveness.

Figure 29. R&D EXPENDITURES IN SECTOR "ENTERPRISES" AND IN THE ICT SECTOR AS % OF TOTAL R&D EXPENDITURES IN THE COUNTRY



Source: Eurostat, 2011.

According to an analysis of innovations in the ICT sector in Bulgaria for the period 2006 – 2011, there are a number of highly innovative companies which work largely for foreign niche markets. Many of the achievements of these companies remain unknown to the general public, policy makers and experts without an immediate interest in the ICT sector. All of these highly innovative companies make intensive R&D efforts, and in some cases the larger part of the activity and staff fall under the definition of R&D (for example, multinational companies such as BMware Bulgaria, SAP Labs Bulgaria and others have relocated some of their R&D centres to Bulgaria, and there are R&D intensive local and foreign software companies such as Ontotext – part of Sirma Group, Interconsult Bulgaria, TechnoLogica, Telerik, and Chaos Software). There are other companies as well, mainly hardware manufacturers, where R&D accounts for an important, though not the largest, share in the overall activity (such companies include Johnson Controls Electronics Bulgaria, Epic Electronic Assembly, Datecs, Daisy Technology, AMK Drive and Control technology, Optix, Samel 90, and others). Even if only the above listed companies are taken into consideration, which undoubtedly carry out R&D activities, as well as the Bulgarian companies participating in R&D projects financed under national and international programmes, the official number of R&D staff appears greatly underreported. Conservative estimates by experts at ARC Fund demonstrate that **there are at least 120 ICT companies involved in R&D and the total number of employees working in the field of R&D is at least 5 times greater than officially reported.**

Set against the officially reported R&D expenditures by enterprises as a whole (which are nearly 5 times greater compared to 2005 in absolute terms) and public R&D spending (which is roughly 2 times greater), the mere 24 % increase in R&D expenditures in the ICT sector is a cause for concern. Many factors may account for this disparity, including non-reporting of the full expenditures, as was already noted, as well as the fact that a higher percentage of companies from non-ICT sectors have been beneficiaries of European funding.

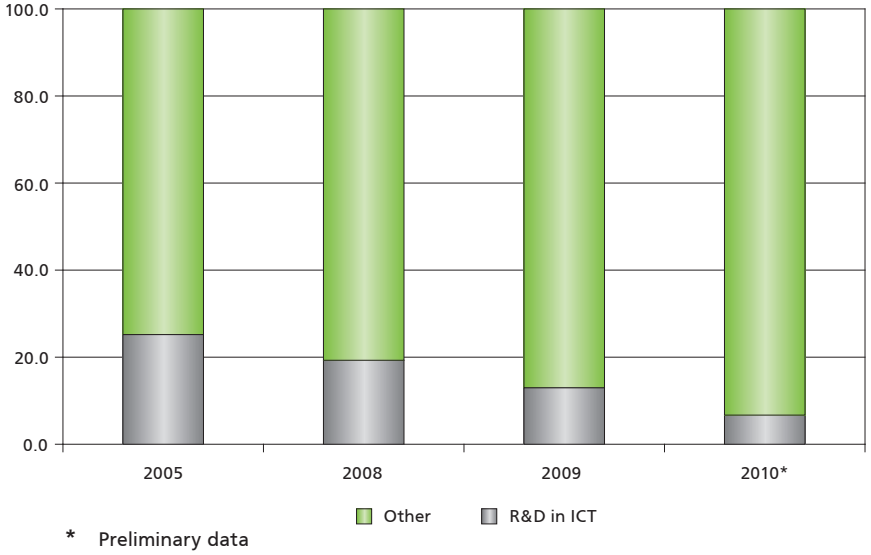
The reported R&D expenditures of enterprises show that they are rapidly catching up with the public sector R&D expenditures in this area. The share of R&D expenditures in the total expenditures of ICT enterprises, however, dropped from 5.4 % in 2005 to 3.3 % in 2010. This decline is all the more visible when considering the expenditures of the enterprises as a whole, where the share of ICT enterprises fell from 25.1 % of total spending on R&D in 2005 to 6.6 % in 2010.

Another interesting characteristic of the reported R&D spending in the ICT sector is the declining average reported expenditure per employee in R&D. This went from BGN 46 thousand per person in 2008 to BGN 26 thousand per person in 2010. This indicates lower average salaries in the ICT sector and consequently no capital expenditures on research and development. If the data are correct, the crisis has brought about a shrinking of capital expenditures on

R&D among ICT companies. Yet at the same time, it means that available resources have been used more intensively in order to meet increased demand.

The small number of ICT enterprises reporting to the NSI is also a problem because it reinforces the perception that there is a low level of innovation performance among enterprises in this sector. This creates the wrong impression that there are no conditions for innovation in the ICT sector in Bulgaria. Another problem is posed by high data confidentiality. This makes it practically impossible to conduct an in-depth analysis of the ICT sector by the respective component sections, groups and classes under NACE-2008, as well as by geographic distribution. This impedes the formulation of an adequate policy for the development of regional innovative strategies in the field of ICT.

Figure 30. STRUCTURE OF R&D EXPENDITURES IN SECTOR "ENTERPRISES"



* Preliminary data

Source: Eurostat, 2011.

With regard to most data on R&D expenditures at the four-digit code level under NACE-2008, information is either absent because of non-reporting business entities or because the data are confidential. In a certain sense, the main piece of information that can be obtained from the NSI

Table 7. SHARE OF CONFIDENTIALITY CASES IN THE R&D EXPENDITURE AND PERSONNEL DATA IN THE ICT SECTOR

Confidentiality criteria[48]	Expenditures						Staff
	Total	By source of financing					
		Enterprises	Public sector	Higher education	Not-for-profit organisations	Foreign	
2008							
Criterion A	46.9	47.3	71.7	na	na	100.0	33.6
Criterion B	1.2	na	na	na	na	na	na
Criterion V	na	51.0	na	na	na	na	2.4
2009							
Criterion A	48.6	44.1	57.9	na	na	100.0	26.1
Criterion B	1.6	1.5	na	na	na	na	na
Criterion V	8.9	8.2	27.4	na	na	na	20.6
2010							
Criterion A	0.6	1.5	20.1	na	na	93.1	1.7
Criterion B	7.3	na	na	na	na	na	na
Criterion V	12.2	58.0	79.9	na	na	na	12.2

Source: NSI, 2011.

[48] Criterion A – statistical data summarising data on fewer than three enterprises.
Criterion B – statistical data where the relative share of a single enterprise accounts for more than 85 per cent of the total volume.
Criterion V – secondary confidentiality, in order not to reveal data under Criteria A or B.

data is whether there is evidence from public sources or in-depth interviews that it is involved in R&D (e.g. has received financing under framework programmes, has been operating as an R&D centre of an international company, has concluded an R&D contract with the government using data from the Public Procurement Agency, and so on) and whether it reports its R&D expenditures or not.

Despite the fact that there has been increased reporting in the period 2008 – 2010 and data confidentiality has declined, nearly half of the data cells for which information about R&D staff or expenditures in the ICT sector is available remain confidential.

Eighty per cent of the R&D expenditures in the ICT sector in 2010 were made in class 26.30 ("Manufacture of communication equipment"), class 46.5 (firms classified under 'Wholesale of information and communication equipment' but engaged in R&D related to hardware manufacture) and division 62 (Computer programming, consultancy and related activities). Division 62 accounts for more than 50 % of the expenditures and up to 70 % of those engaged in R&D in the sector (by reported data).

Trends in Company Innovation in the ICT Sector

The analysis of the research, development and innovation (R&D&I) of companies in the ICT sector makes it possible to outline the following trends.[49]

First, there appear to be serious competitive advantages in R&D for companies manufacturing office equipment, sophisticated measuring instruments, and optical products. There are local Bulgarian companies with established R&D laboratories and staff engaged in the development of new products. Domestic manufacturers (e.g. Daisy Technology) take on deliveries for large multinational companies such as Nokia and Alcatel. When implementing innovative projects, the companies draw on foreign know-how but overall the projects are developed locally.

Second, a large number of the local offices of telecommunications companies have units created for the purpose of developing new services with high added value. Due to the specifics of the implementation of complex research projects, telecommunications companies often work jointly with firms performing other ICT activities. Within the sector, small new companies have emerged whose chief function is to provide new services with high added value (e.g. SMS value-added services), which require considerable investments in the early stages of their development.

Third, there are a number of companies outside the ICT sector, which are intensive consumers of ICT services. These services are either provided by ICT companies, or may actually provide this type of services themselves in addition to their main field of activity. A case in point is AMK in Gabrovo, which is a Bulgarian subsidiary of a German engine manufacturer and is run by an electronics engineer and former owner of an electronics company. The Bulgarian branch of AMK has an ICT unit for R&D&I. It also works on a number of projects in close cooperation with specialists from the Technical University in Gabrovo.

Fourth, there exist a large number of small companies engaged in intensive R&D&I with financing from European programs. Most have been created by, or work in close cooperation with, academics from universities and the Bulgarian Academy of Sciences (BAS). One exception to this is Sirma Solutions, which has been acknowledged by the Ministry of Education, Youth, and Science as the company having most actively implemented projects under the 6th Framework Program. The company applies for financing directly, or through its joint venture Ontotext. In addition, the company hires academics from Sofia University and BAS.

Fifth, there is a cluster of foreign companies which have permanently relocated their activity to this country (e.g. Tumbleweed) or outsource R&D&I and database maintenance to Bulgarian companies.

Sixth, there are ICT companies which used to be engaged in intensive R&D but for various reasons suspended it or took up a different area of activity (e.g. reselling or outsourcing). One such example is Rila Solutions, which began its activity with risk financing as a joint venture with the Bulgarian Telecommunications Company. After the dot-com bubble burst in 2001, the company withdrew from R&D and concentrated on outsourcing.

Seventh, very often small companies in the field of ICT engage in R&D as

[49] See Table 8.

a result of the rapidly changing or increasing requirements of end users. Such companies include most of the providers of legal information systems (DAXY, APIS and CIELA) or developers of accounting or management software (Microinvest and BonevSoft).

Eighth, some companies act as innovation hubs, providing high-technology services (speedy prototyping, three-dimensional modelling, and virtual testing) to major system integrators, R&D&I laboratories in the field of ICT, and companies in the field of automation and machine engineering. In the process they often serve competing companies in a specific field, which makes them an important link in the technological chain in the sector (for instance, Ditra/TechnoLogica).

Table 8. TYPOLOGY OF ICT COMPANIES IN BULGARIA AND THEIR RESEARCH*

Serial entrepreneurs	This group includes both individuals and legal entities. The individuals fit the classic definition of serial entrepreneurs are those with more than one successful business venture. The companies included in this category are either the object of serial entrepreneurship or are involved in setting up new companies in the form of joint ventures or spin-offs.
Research laboratories in the field of ICT as part of a Bulgarian or foreign company operating in Bulgaria in a different sector	All too often, these companies come from other sectors and set up ICT laboratories which serve their own main activity. They are typically active in the sectors of machine engineering, automation, etc. Along with their main activity, they have clearly defined long-term goals in the field of ICT.
Subsidiaries of multinational companies in Bulgaria with R&D activity (outsourcing)	National branches engaged in R&D in the field of ICT as their main or additional activity.
R&D 'profits & loss'	Companies which in the past have engaged in R&D in the field of ICT but for some reason (new area of activity, reselling or outsourcing) left the ICT sector.
ICT companies providing products/ services for the development of the military sector	ICT companies fully or partially specialised in the provision of military-related services/ products. They operate mainly in the field of radio- and telecommunications, or the so-called C4I (Command, Control, Communications, Computers, and Intelligence services).
Academic spin-offs, typically created as part of projects under EU or NATO programmes	ICT companies with a significant role in implementation of ICT research projects.
Original Bulgarian brands, including successful start-ups	ICT companies which manufacture/provide/export original Bulgarian brands (products or services) or significantly improved ones. In many cases they hold the respective intellectual property rights.
Innovation hubs	ICT companies offering high-tech innovative services (speedy prototyping, 3D modelling, virtual testing of machines and components). These include big system integrators or ICT research laboratories.
High-risk start-up companies	Start-up companies based on risk financing.

* A company can belong to more than one category.

Source: ARC Fund, 2011.

Box 6. THE CREATIVE INDUSTRIES – DEVELOPING THE POTENTIAL FOR A KNOWLEDGE-BASED ECONOMY

The European Commission notes that "the cultural and creative industries of the economy are important driving engines for the economic and social innovations in other sectors".[50,51] The term 'creative industries' covers a wide-ranging group of economic activities. The following 13 sectors fall under this definition: advertising, architecture, art and antiques, computer games, arts and crafts, design, fashion design, motion pictures and video, music, scenic arts, publishing, software, television and radio.[52]

[50] An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage, European Commission COM(2010) 614.

[51] European Competitiveness Report 2010, European Commission DG-Enterprise and Industry, 2010.

[52] These are the subsectors included in the U.K. Department for Culture, Media and Sport definition. http://www.idea.gov.uk/idk/core/page.do?pageId=11136366

Box 6. THE CREATIVE INDUSTRIES – DEVELOPING THE POTENTIAL FOR A KNOWLEDGE-BASED ECONOMY (CONTINUED)

As regards commercial activities in copyright-related sectors (including press and literature, visual and graphic arts, music, theatre and opera, photography, film and video, radio and television, advertising, software, and databases), in 2005 the employed in these areas numbered 104,814, which constituted 4.3 % of the total workforce, with 2.81 % contribution to GDP.[53] According to other estimates, of the number of those employed in the cultural sectors,[54] they represented 1.5 % of total employment in 2009,[55] or 49,600 people. Some of the analyses cite 93,323 people employed in culture and creative sectors in 2009 (of whom 54,293 in the capital Sofia), or 3.4 % of those employed in Bulgaria.[56] Furthermore, a report by the European Cluster Observatory, drawing on data on 2006 – 2007, concluded that 2.89 % of the Bulgarian workforce (71,442 people) worked in cultural and creative industries.[57] The next table illustrates the various indicators and definitions for measuring employment and economic output of cultural and creative industries.

Report	Sectors monitored	Employment data, people	GDP contribution
Contribution to the economy of copyright-related industries in Bulgaria (data on 2005)	Main industries: press and literature, visual and graphic arts, music, theatre and opera, photography, film and video, radio and television, advertising, software, and databases.	66,304 (2.7 %)	2.81 %
Statistical data on the cultural industries, Eurostat databases (2011 edition) (data on 2009)	NACE 58 – Publishing NACE 59 – Film, video, television programming production, sound recording and music publishing NACE 60 – Radio and television broadcasting NACE 90 – Creative arts and entertainment NACE 91 – Libraries, archives, museums, and other cultural activities	49,600 (1,5 %)	N/A
Mapping the cultural and creative industries in Sofia – 2011 (data on 2009)	**Art and heritage** (unique products, competitive consumption; consumption in the process of creation) **Cultural industries** (mass reproduction and dissemination of the cultural product by industrial methods and ICT) **Creative industries** (intermediate consumption of the cultural product in the process of creation of other products, not directly related to the cultural industry)	93,323 (3.4 %)	3.7 %
Priority sector report: Creative and cultural industries (2006 – 2007)	Creative and cultural institutions Methodological appendix, p.8-9 of Priority sector report	71,442 (2.89 %)	N/A

The cultural and creative industries in Bulgaria had about 4.82 % increase in employment between 2003 – 2004 and 2008 – 2009 (increase in the economy as a whole was 3.13 % in the same period[58]), and public spending on culture in the period 2002 – 2009 ranged between 0.64-0.75 % of GDP.[59] This indicator places the country in a similar situation as many other EU member states. The unused potential in these sectors is particularly significant given its consequences for growth and employment, for new skills and jobs and the innovation potential for achieving the Europe 2020 targets.

Source: ARC Fund, 2012.

[53] The Economic Contribution of Copyright-Based Industries in Bulgaria, WIPO and Bulgarian Ministry of Culture, 2007. Retrieved from: http://www.wipo.int/ip-development/en/creative_industry/pdf/1009E-4.pdf

[54] Which include NACE Rev.2 codes: 58, 59, 60, 90, 91.

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[58] Ibid.

[59] Compendium of Cultural Policies and Trends in Europe, 13th edition, Steering Committee for Culture of the Council of Europe, 2012. http://www.culturalpolicies.net/web/bulgaria.php?aid=621

Policy Recommendations for ICT Sector Development[60]

1. **Improving the statistical coverage of R&D implemented by Bulgarian ICT Companies.**

A **public-private partnership** is needed among the National Statistical Institute, the Ministry of the Economy, Energy, and Tourism, the Ministry of Transport, Information Technologies, and Communications, business associations in the sector (BASSCOM, BIAT, ASTEL, and others), and other representatives of nongovernmental organisations in order **to develop and implement a programme to increase the rate of reporting of R&D data to NSI by ICT companies**. Such a programme should include:

1.1. **An awareness campaign** about the need to report R&D and the consequences for public policies of such low levels or reported investments in R&D.

1.2. **Directly approaching the major multinational companies involved in R&D but not reporting it in Bulgaria and soliciting information from them.**

1.3. **Financing the development of special accounting modules** for R&D, **as well as education programmes and training** for accountants in ICT sector to improve their skills and capacity to report on R&D expenditures.

1.4. **Creating tax incentives** for ICT (and all other) companies to engage in R&D and its subsequent correct reporting. This could be done through the planned Law on Innovation.

1.5. **Facilitating the financing of R&D in ICT companies** through the funds of OP Competitiveness and **improving the coordination** between the **National Innovation Fund** with the Ministry of the Economy, Energy, and Tourism and the **National Science Fund** with the Ministry of Education, Youth, and Science.

2. **Increasing the state subsidy and admission of students** to ICT-related undergraduate academic programmes.

Increasing the number of doctoral students in ICT majors and setting up **special scholarships** for the most advanced students. Developing **special programmes to attract and retain** highly qualified ICT specialists in Bulgaria by partial student loan reduction if they work in Bulgaria for a certain number of years after their graduation. **Creating a special financial instrument for researchers** in order to encourage publications in specialised ICT journals with high impact factor. **Increasing the financing for and appeal of science, technology, engineering and mathematics (STEM) education in secondary schools**, which would lead to higher quality and number of applicants for ICT engineering and software majors.

3. **Developing guidelines for the Invest Bulgaria Agency,** which should approach foreign companies interested in investing in Bulgaria, to **offshore their R&D to Bulgaria** activities rather than just set up maintenance centres. These companies should be offered joint programmes for financing ICT students and training events, which would assist them to some degree in the recruitment of specialised personnel. Large foreign companies, mainly in the electronics sector, should be encouraged to relocate partly or fully their R&D units from other countries. One such particularly suitable target is Epic Electronics in Botevgrad, which is the largest plant in the world from the Epic group, yet does little R&D.

4. **Focusing the planned Technology Park-Sofia only on R&D intensive companies.**

These companies can be identified by the large number of employees engaged in R&D in Bulgaria, and by the fact they have applied for or hold patents and/or have numerous scientific publications through their Bulgarian offices. The Technology Park-Sofia should be used as an instrument for innovative implementation of ICT in non-ICT sectors. A good opportunity would be offered by the establishment of laboratories likely to be of regional interest. One such laboratory could be set up following the MLab model of the World Bank in order to make use of the potential of Bulgarian companies in the field of mobile applications. Another possibility is to use the supercomputer currently managed by the Ministry of Transport, Information Technologies, and Communications in cooperation with teams of Sofia University and BAS. Another promising field is that of avionics which provides opportunities for highly intensive R&D in ICT with possible application in other sectors. It would be worthwhile to include a business incubator as part of the Technology Park.

[60] These recommendations have been developed under the project 'Analysis of the current state and identification of innovation development trends in the field of ICT' implemented in the period October 2011 – February 2012 with the financial assistance of the Bulgarian-Korean ICT Coordination Center with Sofia University. For the purposes of the present analysis, some of the recommendations have been updated in line with the latest development of ICT policies in Bulgaria.

5. **Facilitating the introduction of pre-commercial procurement in legislation and practice.**

Such a step could have a far broader impact on government policies aimed at stimulating the development of innovative processes, products and services than the sector-specific measures. Nevertheless, ICT companies would be in the best position to take advantage of pre-commercial procurement. The potential demand for R&D by the government is largely related to the development and implementation of e-government.

Pre-commercial procurement can be introduced both with regard to national (centrally managed) projects such as online healthcare services, and at the local government level, to introduce new public services.

More specifically, it is important to:

5.1. **Popularise the concept of pre-commercial procurement** so that the business community and the general public would accept the idea and support its incorporation in the legal framework.

5.2. Provide a **financial instrument** for the implementation of at least a few pre-commercial procurement calls in the field of ICT in 2013, allowing **coordinated financing** schemes under programmes managed directly by the European Commission, under European funds managed by Bulgarian institutions, and financing from the national or municipal budgets.

6. **The recently launched national foresight programme in the field of ICT,** coordinated by the Ministry of Education, Youth, and Science should provide for effective involvement of the Ministry of Transport, Information Technologies and Communications, since it is currently planning at least one specific large-scale project (broadband internet) with a timespan of at least 10 years (3-year implementation and a minimum of 7 years of operation). The foresight initiative needs to build on the pilot e-government foresight conducted in 2002 – 2004, which has a time horizon until 2015.

7. **Creating a special programme for encouraging journalism in the fields of innovation, R&D, and ICT.**

More adequate media coverage of the achievements of Bulgarian technological companies would enhance the prestige of engineering majors. Furthermore, policy-makers who are informed largely by the mass media would have a better idea of the country's economy, of its potential, of what type of companies should be eligible for government aid and how they could be assisted outside government aid.

8. **Making the process of formulating national positions in international trade agreement negotiations, European directives at the preparatory stage, as well as on legislation at the European Parliament level, more participatory.** In this way, experiences such as the controversy surrounding the Anti-Counterfeiting Trade Agreement (ACTA) would be avoided and potential adverse effects on Bulgarian ICT businesses would be minimised. In this regard, there are representatives from the Bulgarian civil society who seem to be far more prepared than the public administration to get involved in these processes and defend the interests of citizens and business alike.

9. It is necessary for all stakeholders in ICT development – business associations, experts, companies, ICT academic departments, and NGOs to achieve an understanding with all parliamentary political parties on the need for **establishing a government ministry, headed by a minister with the rank of deputy prime minister, responsible for ICT, innovation, science, higher education, and e-government**.

This need is typically acknowledged prior to elections when it is far too late. Political parties never manage to find the right formula to align the experts and various business lobbies in the ICT sphere. The idea has never been realised mainly because of the **absence of a political leader in the field of ICT and innovation**.

10. **The Ministry of Foreign Affairs needs to work more actively regarding the Bulgarian Official Development Assistance (ODA).**

Support for information societies in developing and transitioning countries can be made a priority in Bulgarian ODA. Such support could draw on the experience of both ICT entrepreneurs and civil society in Bulgaria for the implementation of collaborative projects. ODA can also be used to make economic considerations more prominent in the country's foreign policy and export of good practices, which in turn may serve as the basis for subsequent outsourcing and offshoring of Bulgarian companies to new destinations. ODA can be used to make the economy a higher priority in the country's foreign policy and to export good practices. The initiative launched and implemented by the private sector for the use of the Bulgarian model of broadband connectivity in India, for instance, could be transferred to other countries experiencing problems with internet cost and quality.

11. **A national strategy on the development of innovation, technology and research is needed.**

The adoption of a single strategic document in these related fields would overcome the fragmentation and duplication of measures and inefficient use of resources, erratic updating of individual strategies (sometimes overdue by 4-5 years) and their adoption at different government levels (Council of Ministers, National Assembly, advisory councils, etc). At the present time, Bulgaria is without a coordinated financial framework in the areas of innovation, technology and science, which means that it is currently without secured financial resources in these areas.

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