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EXECUTIVE SUMMARY

The aim of this document is to highlight state of the art of the **regional context in Bulgaria which describes the current situation** with respect to **product and service innovation in SMEs**, **the characteristics of the enterprises of the region where the questionnaires/interviews where done**, **the characteristics of the participants in the field work**.

Creativity techniques for innovation in products and services in Bulgaria

Context which describes the current situation with respect to

product and service innovation in SMEs

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1 INTRODUCTION

The report on innovation and creativity provides a reliable annual assessment of the innovation potential of the Bulgarian SMEs and business representative organizations supporting the business the condition and opportunities for development of the Bulgarian innovation system. It makes recommendations for the improvement of public policy on creativity and innovation by drawing on the latest theoretical and empirical studies worldwide and adapting them to the specific economic, political, cultural and institutional framework of Bulgaria's innovation system. The Expert Council on Innovation of the Applied Research and Communications Fund endorsed the report. The report is aimed at the leaders – the people making the decisions in the public and private sectors of the country. The purpose is to assess the potential of innovation and creativity of the Bulgarian SMEs and to suggest possible solutions for the development of Bulgaria's innovation policy in response to the global economic crisis.

The current year 2009 marks a shift in the development of the global, European and Bulgarian economies. For the first time since its establishment in 1999, the Eurozone – the EU member states which use the euro as a common currency – has slumped into a recession. In 2009, the Bulgarian economy is expected to have no growth for the first time in eleven years. The world is facing the most serious economic crisis since the Great Depression. This situation calls for swift and bold measures by government and business leaders for turning the crisis into an opportunity and for economic recovery. Bulgaria needs to rethink its economic policy and adopt an integrated strategy for economic growth based on innovation, technological development and science. In 2009, Bulgaria marks its third year as an EU member, which should allow the country to make full use of the Community's instruments for economic development.Still, steady economic growth has not brought about improved innovation potential to the Bulgarian economy, which impairs its long-term sustainability. The country is not only at the bottom of the Community's Innovation Scoreboard, productivity and GDP per person but has also seen a decline in some aspects of innovation performance in the past year. The rapid GDP growth of the past few years has been primarily due to two factors (which fall under the category of 'extensive development' not associated with higher innovation intensity) – reduced unemployment, including by the entry of foreign workers, and the wide availability of financial resources in the form of foreign direct investment and easy credit. These factors are important when the country is catching up but quickly exhaust their potential and are not capable of ensuring

long term competitiveness. They need to be complemented by other sources of growth such as technological renewal, integrating more knowledge into products, hiring of highly skilled employees and the promotion of the rapidly growing "green" sectors of the economy. The financial crisis and the serious difficulties faced by the economy warrant the need for a rethinking of long-term priorities and the mobilization and re10 direction of efforts at the national and company level. In a time of economic recession, shrinking markets, and reduced investment activity, the Bulgarian government needs to establish an environment favorable to the development and deployment of innovation – this includes the upgrading of research infrastructure, promoting science and technology, and growing a high tech sector. The government should seek ways to optimize cooperation within the innovation system through an integrated innovation, technological and science policy. It is crucial that the highest level of government in Bulgaria undertakes the political commitment for the successful implementation of such a strategy. and performed without proper coordination). The governments of all leading world economies are undertaking specific policy actions to that effect. The report provides a reliable annual assessment of the innovation potential of the Bulgarian economy and the conditions and opportunities for development of the Bulgarian innovation system. It makes recommendations for the improvement of public policy on innovation by drawing on the latest theoretical and empirical studies worldwide and adapting them to the specific economic, political, cultural and institutional framework of Bulgaria's innovation system.

The report targets the innovation managers and agents – the people making the strategic choices in the public and private sectors of the country. The purpose of the current, 2009 edition of *Innovation.bg* is to discuss the innovation activity of the Bulgarian economy as compared to the rest of the EU member states and to suggest possible solutions for the development of Bulgaria's innovation policy. analyzes the condition and opportunities for development of the Bulgarian innovation system based on five groups of indicators:

• gross innovation product;

• entrepreneurship and innovation networks;

• investment and financing of innovation;

• human capital for innovation;

• information and communication technologies.

The report is based on the Innovation Index of Bulgarian Enterprises, which

is constructed on the basis of the annual survey of innovation activity of Bulgarian enterprises carried out by the Applied Research and Communications Fund. As on previous occasions, the Expert Council on Innovation of the Applied Research and Communications Fund endorsed the report.

2 Innovation Policies of the EU and Bulgaria in a Time of Global Economic Crisis

The report is based on several existing models for measuring and comparing innovation systems: - The European Innovation Scoreboard of the European Commission; - OECD's Science, Technology and Industry Scoreboard;- The National Innovation Initiative of the US;

Bulgaria's membership in the EU presents an exceptional opportunity for the competitive and innovation-led development of the country. Being a small, open economy Bulgaria should make best use of its the access to a variety of technical aid and financial instruments of the Community to develop its own national policy on innovation, technological development and research in order to overcome its lagging behind the other member states and to deal with the effects of the global economic crisis.

Challenges and Prospects For the Research and Innovation Policy of Bulgaria In the field of research the main EU task is the development of the European Research Area. Its priorities remain unchanged: • promoting the fifth freedom – unhampered

mobility for researchers, technology and knowledge;

• joint strategic programming of national research;

• favorable environment for all participants in the research and business sectors, including SMEs;

• access to a research infrastructure of the highest quality;

• attracting foreign researchers.

The free movement of researchers is of particular importance given the fact that even in case the Lisbon target of 3% R&D of GDP is reached, investments would not be as effective if they could not move freely in order to produce results where the research infrastructure is best. Increased communication produced by the European Research Area also addresses national research efforts which continue to duplicate each other through public financing as well as the high costs of patenting.

Bulgaria needs to be more active in participating in the design and implementation of European policies in the field of innovation and research while at the same time clearly defining its interest and capacity to participate in the framework and operational programs of the EU.

Bulgaria has registered only modest progress in the field of innovation policy since the first publication of *Innovation.bg* four years ago. It was only during the last two years that policy makers recognized their commitment and the need for actions aimed at producing progress in the priority areas of the Lisbon Strategy. Measures so far remain, however, ad hoc without any overall strategy and do not lead to a tangible improvement of the innovation potential of the country.3 The approach applied to the design and delivery of policies (lack of appropriate public debate and dialogue among interested parties, lack of transparency and system of monitoring and control of results) does not allow a proper evaluation or the development of the innovation potential of the innovation system units, including cooperation among them. Innovation policy measures adopted by the Bulgarian government do not envisage measures aimed at overcoming underlying factors for the problems (due to the lack of comprehensive analysis and the mechanical adoption of foreign experience which are mostly aimed at their effects and not their

causes) and are not consistently implemented. In 2008 for example, the National Innovation Council held no meetings whatsoever despite the apparent inadequacy of the goals and measures of the National Innovation Strategy adopted in 2004 to the economic realities of today. At the same time, the drafting of a National Strategy for the Development of Research 2008-2018 was initiated although the previous National Strategy for Research 2005-2010 had not yet been adopted by the national parliament. Bulgaria's progress in research and innovation policy, however, does not correspond to the potential of the national economy and is not sufficient for arresting the effects of the deepening global recession in the country. Critical mass is lacking in Bulgaria in that its research and educational infrastructure remain fragmented leading to a wasted research potential. Business is only marginally involved in the innovation process and the interaction between the components of the innovation system is ineffective. The country continues its relative decline on a number of indicators for measuring its innovation potential. There are problem areas as regards human resources, innovation culture and education, which bring about Implementation of the Lisbon Strategy Structural Reforms in the Context of the European Economic Recovery Plan: Annual Country Assessment – a Detailed Overview of Progress Made with the Implementation of the Lisbon Strategy Reform in Member States in 2008, Commission of the European Communities, Brussels, 2009. A thorough analysis of the shortcomings of the process of development and implementation of the research, technological, and innovation policy in Bulgaria is provided in the 2006 and 2007 Innovation.bg reports. serious long term demographic, economic and social challenges for Bulgaria.

Demographic:

• ageing and shrinking population;

• declining share of the economically active population;

In education: • deteriorating quality of the educational services both with time (compared to preceding periods) and with each subsequent educational degree. The dropout rate for school students without any qualification is more than 20%; • a brain drain (currently in the form of university education abroad).

The condition of the research and educational infrastructure and the financial stimulus make Bulgaria unattractive for young talents and leading researchers and do not contribute to a return of Bulgarian experts who have chosen a professional career aboard; • declining qualifications – Bulgaria ranks last on the indicators for lifelong learning; • discrepancies between the supply and demand on the labor market as regards qualification levels, professional experience, knowledge and skills among secondary and higher education graduates. In research: • Insufficient number of those employed in R&D and ineffective structure of sectoral employment.

As regards the share of R&D as a percentage of GDP (0.48% for Bulgaria compared to 1.83% for EU 27 and a 3% Lisbon Strategy target) Bulgaria is at the bottom of the European list for yet another year, while the

downward trend of the last 10 years threatens to make the country's lagging behind a lasting one leading to unsustainable growth. Against this background, the National Research Strategy goal to increase R&D expenditures to 1.8% by 2018 does not seem credible and substantiated, particularly considering that the country could not achieve even the modest targets of the National Innovation Strategy (2004).

Experience shows that R&D and innovation are the first expense items to go, when companies start looking for cuts in a time of crisis. In such circumstances, public investment in R&D and innovation becomes all the more significant. It is crucial to further clarify national priorities and address the strategic challenges (global warming, ageing population). The adoption of a transparent mechanism for accountability and oversight would be critical for the effective use of the resources of the Framework and Structural funds. Political commitment is a critical factor for the innovation performance of the economy and the functioning

of the national innovation system. Integrated economic, innovation, technological and research policies and specific steps for ensuring the administrative, personnel and financial support for their delivery are still not present in 2008-2009 in Bulgaria. Innovation, technological development and research have not been established as priorities for the Bulgarian government and as key factor for the competitiveness of the country's economy. The following conclusions and assessments, applicable during the past few years, are related to the establishment of an integrated innovation, technological and research policy and the mechanisms for its delivery:

Research and innovation are not recognized as national priority.

There is no clear strategy and political will for reforming the national innovation system. R&D investments in Bulgaria are decreasing relative to the growing costs of running the administration. • There is no focal point where political decisions are made in order to provide coordination of national innovation, technological and research policies and commitment to the development

of the innovation potential of the country. • The national innovation system is still a chaotic set of public and private organizations, which lack dialogue and interaction. The institutional and organizational structure of the innovation system

does not reflect market realities and the necessary reforms.

There is a pronounced divergence among Bulgarian regions as regards their innovation potential. The concentration of the research infrastructure and the financial and human resources mostly in the Southwest Planning Region is one of the reasons for the low levels of effectiveness of the entire national innovation system.

This prevents the development of regional competitive advantages based on indigenous entrepreneurship

and innovation. In 2009, the challenges for maintaining financial and economic stability will be mounting, including as regards

the mobilization of resources for a catching-up, innovation-led development. Advancing globalization and growing interdependence between countries and regions preclude the existence of islands of stability during a worldwide financial and economic crisis. A small economy – such as that of Bulgaria – cannot escape the negative impact of trends and processes, for which it does not bear direct responsibility. It can, however, purposefully maintain and seek new attractiveness, and position itself strategically on the international political and business stage. Small economies are more flexible and thus capable of shifting resources among priorities, sectors, regions and areas of influence and interest. Turning small size into an advantage requires the skill of identifying the micro-trends (the weak, minute signs of change, which set tomorrow's big trends) of upcoming changes (instead of ignoring them) and adapting correspondingly. Bulgaria is an open economy, closely linked to the international markets both as regards access to resources, including capital, and as regards demand for its produce. Reacting postfactum, after the event, however, is not an option when this kind of dependency exists. The government should embrace an effective counterbalance policy to the influence of external factors instead. Bulgaria needs to use the crisis as an opportunity to mobilize resources for change and revival on the basis of new sources of growth. To this end, the question that needs to be answered is – What kind of economy does Bulgaria strive after?

• competitive – in 2008, Bulgaria is still at the bottom, far behind the rest of the EU member states as regards its GDP (38.5% of the EU average) and productivity per employee (35.1% of the EU-27 average);

• innovative – with a share of innovative enterprises of 20% Bulgaria is last among EU member states;

• sustainable and "green" – there are no signs that the role of technologies in solving the problems of contemporary societies is being recognized to its full extent in this country.

All these goals are achievable only through innovation. It is no chance that large economies, while "bailing out" their financial sectors and other industries, do not cease to invest in R&D and innovation. This is evident in the actions of many governments having invested in new technologies and innovation as a solution to previous economic crises. The effective use of the potential of science and technology in Bulgaria through the active involvement of all components of the innovation ecosystem requires resolute decisions for carrying out of at least the following three main actions:

1. The adoption of an integrated national policy for research, technology and innovation driven by a clear evaluation of the scientific and innovation potential of the country and based on a consensus on the directions for development, including in the context of Bulgaria's further integration in the European area for research and education.

The challenges of contemporary development require the Bulgarian government to hold a broad public debate involving all interested parties in the design of research, technology and innovation policy and to undertake tangible actions as opposed to the current mere declarations on innovation.

At the European level such a debate is ongoing within the Lisbon Forum of the European Parliament.

In 2009, it will be complemented by debates in the framework of the European Year of Creativity and Innovation.

Bulgaria needs an integrated strategy for research, technological development and innovation, which would protect the interests and enhance the competencies of all types of participants in the research and development of new knowledge. These would include research and educational institutions, technology brokers and intermediaries and business. One of the attempts at action in this direction in 2009 is the intended merging of the National Innovation Fund and the National Science Fund. Yet again, however, this decision was made in a non-transparent way without debate, which incited institutional opposition and resistance rather than achieve unity and coordination of the various points of view. The government needs to clearly define the priorities and expected results – as well as appoint the institutions responsible for their attainment – for the manifold increase in the funding for the National Innovation Fund and the National Science Fund during the past two years. Higher effectiveness of

public investments in innovation can only be achieved through a clear plan for complementarity of the resources

from the various national and European programs and instruments available in Bulgaria. These include the two national funds, the Bulgarian Development Bank, the research budgets of all ministries, not just of the MES and MEE but also including defense, health care, environment, etc., the operational programs, the framework programs of the EU, the initiatives of the European Investment Bank, etc. For example, Bulgaria is still among the few EU member states, which do not have an instrument for co-financing of projects awarded to national organizations under the Competitiveness and Innovation Framework Program of the EU.

The absence of short-term benefits will not be the only result of the lack of coordinated national policy for research and innovation and a clear program for its implementation. It would exacerbate already serious problems, leading to further lagging behind the average European levels and it would raise the social and economic cost of their future resolution.

The development of an integrated research, technology and innovation policy should be based on a clear

There is considerable potential in the network industries (ICT, transport, energy) to provide horizontal technologies and an environment for the growth of the economy as a whole.

These include knowledge intensive services, biotechnologies and renewable sources of energy. There are several advantages to making such a choice:

• in these sectors Bulgaria has established traditions, potential, and competencies in the form of advanced scientific knowledge, technological know-how and successful innovation practices; • a sectoral prioritization could provide the setting and the platform for enhanced entrepreneurial and innovation activity; • investing in the development of these sectors offsets the recession and contributes towards the solution of long term social and economic problems (generating higher productivity and employment in the knowledge intensive sectors; creating incentives for the qualification of highly skilled experts; leading to reduced energy intensiveness, higher energy efficiency and help overcome energy dependency; establishing a sustainable environment for growth). Such a policy would match the innovation activity of the leading world economies and would be directly linked to the priorities at European level. Its implementation would contribute to overcoming the low technology profile of the country and to building of a knowledge-intensive economy.

The establishment of a center of responsibility over innovation policy decisions, which would coordinate the operation of the various public bodies of the national innovation system (direct participants or those who facilitate the implementation of the innovation process) and would take decisions on the design and delivery of the national research and innovation policy. The currently fragmented and uncoordinated mechanism for the implementation of research and innovation policies in Bulgaria, involving various ministries, bodies and agencies warrants a radical decision for the establishment of a strong structure, such as a ministry or an agency for research, technological development and innovation under the direct management of the

Prime Minister. Successful practices at national and regional level in the European Union highlight the significance of having a single political focal point for decision making in the field or research, technological development and innovation.

The development of sustainable and effective interaction between the various agents of the national innovation system – research and higher education institutions, innovative companies, intermediary organizations. The interaction between the agents of the national innovation system for the creation, distribution, transfer and adoption of innovation products needs richer content, as well as improved mechanisms and modes of operation. This purpose can best be served by strengthening the network of intermediary and transfer organizations, and the expansion of an emerging new type of bodies: innovation centers, spin-off companies, research and innovation clusters, science parks, and social networks. The administrative capacity of national and regional authorities for the management of innovation development needs to be urgently enhanced. As clearly demonstrated by the Innovation Index of Bulgarian Enterprises in *Innovation.bg 2009*, Bulgarian public and private sector institutions still make little and/or rare use of the potential of the international innovation networks and open innovation systems. The adoption and implementation of an integrated strategy for research, technology and innovation, based on the above three action lines, is a precondition for Bulgaria's economy to enter a new round of sustainable advanced growth during the next decade.

The index provides a summary evaluation of the innovation activity at company level in Bulgaria. It was first calculated in *Innovation.bg 2007.* The index ranks the innovativeness of enterprises according to: (1) the existence and combination of product, process, organizational and marketing innovations in a given enterprise and (2) the degree of novelty of the product and process innovations introduced by the enterprise. The index, designed by the Applied Research and Communications Fund, relies on the annual Survey of the Innovation Activity of Enterprises in Bulgaria (INA) and its values range from 0 to 100, with 0 indicating that the enterprise does not innovate, while 100 meaning that the enterprise combines all four types of innovation at the highest degree of novelty. The innovation index provides a comprehensive evaluation of the innovation intensity of enterprises by measuring not only whether enterprises innovate, but also whether they combine different kinds of innovation, whether innovations are focused on one area or are comprehensive, as well as whether these are gradual or radical.

The types and kinds of innovation, as well as the degree of novelty criteria, have been coordinated with the definitions of the Frascati and Oslo manuals and the methodology of EU's Community Innovation Survey (CIS4) in order to allow for comparability of results. For a more detailed description please refer to http://europa.eu.int/estatref/info/sdds/en/inn/inn_cis4_sm.htm#scope

The basis for the 2006 NSI and Eurostat data for the number of enterprises are non-financial enterprises which file declarations with the NSI. Only sole traders and companies established under the Contracts and Obligations Act (COA) having a turnover above 50,000 and not liable for VAT registration are allowed to apply single-entry accounting. Usually, these are service companies or home production enterprises and in most cases involve self-employed persons and definitely do not qualify for the 10 or more staff criterion.

These comprise all organizations, including state and municipal institutions, universities, NGOs, as well as sole-traders in tobacco and alcohol, which had to register for VAT purposes in 2008. Around 25,000 will be dropped from the VAT register when the latter requirement no longer applies. There are also natural persons having VAT registration. Thus, the actual number of active companies having sufficient turnover to qualify for the surveys of innovation is lower.

Range and Indicators of the Innovation Index

Innovation.bg applies a predominantly positivist approach to the design and application of public policy on innovation. Regardless of some limitations and drawbacks this approach is used in most developed countries and international institutions. It consists of: • *First,* an effective capacity to measure accurately a number of objective indicators for the evaluation of the innovativeness of the economy and the application of generalized cause-and-effect models to existing data; • *Second,* preliminary analysis carried out separately from and without influence on the innovation system; • *Third,* neutral policy delivery both from institutions and considerations not belonging to the system, as well as from internal agents and relations. *Innovation.bg* strives to mitigate the shortcomings of this approach by improving on the measurement and evaluation tools, by emphasizing certain aspects specific of the national business and innovation environment and through providing a number of constructive interpretations. The main instrument developed by the Applied Research and Communications Fund to this end is the

Innovation Index of Bulgarian SMEs

The index distinguishes between seven sub-types of innovation activity at company level of the four types applied by enterprises (product, process, organization and marketing innovation) and three degrees of novelty of the product and process innovations (new to the enterprise, new to the market or new to the world)7. It relies on an annual national survey of enterprises in Bulgaria. Its values range from 0 to 100, with 0 indicating that the enterprise lacks innovation activity, while 100 meaning that the enterprise makes all types of innovation at the highest degree of novelty. By introducing more levels of innovation performance measurement, the index overcomes a variety of problems stemming from the predominant separation of enterprises into two groups (product and process innovators), which either unjustifiably narrows the range of innovators or expands it to an extent where differences within the innovators' group are bigger than between them and those lacking innovation. An aggregate measure of innovation such as the one provided by the index allows, on the one hand, a more comprehensive analysis of factors influencing innovation, and, on the other, the design of better targeted policy responses in support of innovation tailored to the specific needs of each innovator group.

Some of the key considerations in constructing the innovation index have been the identity, number and type of *enterprises* surveyed and, correspondingly, what should the innovation policy targeted at them be. For example, Eurostat, traditionally excludes from its Community Innovation Surveys organizations not falling under the ”Manufacturing” and ”Non-Financial Services” sectors or have less than 10 staff.8 Thus, Eurostat surveys do not cover innovation in the public sector or social services (non-governmental organizations, education and health care), which are significant to the overall innovation environment in the country. Applying Eurostat criteria to Bulgaria would cover 62 % of the gross value added in the economy and 94 % of the enterprises.

The overall number of enterprises in Bulgaria is a fuzzy set and defining its boundaries is a key starting point

for the designing of both the appropriate sample for the innovation survey and of any economic policy. According to the Bulstat register (the national commercial/company register), in 2007 there were 1 million ”active” enterprises in Bulgaria, while according to the National Statistical Institute (NSI) their number at the end of 2006 had been 258,000, of which only 30,000 have staff of 10 or more; this is the set, within which Eurostat seeks the innovative companies. Also 30,000 is the number of enterprises which, although not necessarily the same as above, were involved in foreign trade, according to the Customs Agency. According to 2006 NSI data only 80,000 of the 258,000 are nonfinancial enterprises applying double- entry accounting.10 At the end of 2008, only 167,00011 compaies were What is mitigated against are not only financial and operational risks but also risk from inspections. No oversight institution has so far managed to conduct inspections of networks of enterprises. Such inspections could limit the opportunities to cover up violations of the law through fictitious contracts within the network. Finding out the actual number of active, indipendent enterprises in Bulgaria is further complicated by the fact that an enterprise is often organized, for legal, accounting and other purposes, in several (three on average) registered companies. There are various reasons for this phenomenon – ranging from the opportunity to issue VAT-free invoices, through risk mitigation12 (for example, it is customary in the construction sector to have each construction site serviced by a new company or a group of several already existing ones), to complicated ownership and control schemes. Companies active briefly for a specific project, public tender, privatization opportunity or financial fraud but not legally terminated afterwards (due to the cumbersome procedure) are not uncommon.

Further, of particular significance when studying the innovation potential of non-financial enterprises is to know their share of the value added or turnover in the economy, not just their number. For example, large enterprises with 250 or more employees generate 27% of the total turnover in the Bulgarian economy and 42% of the GDP (according to NSI data for 2006), while microenterprises (having 9 or less staff) make 88% of the total number of enterprises but produce only 14% of GDP. The top 200 enterprises by revenue generate 25% of the total revenue in the economy, while the first 2,700 generate 33% (for 2006, according to data from the rankings by Aktiv and own calculations). Based on the available statistics and its own calculations, the Applied Research and Communications Fund assumes that for the needs of the current innovation analysis the number of the active enterprises in the Bulgarian economy is around 120,000. Only about 22,000 – 25,000 companies in extraction, manufacturing, construction and transport and com- are typical for those in the middle of the innovation pack (33 i < 66). As the level of innovation activity goes up (i 66), process innovations become leading. This dynamic in the type of the predominant

innovation performed by the Bulgarian enterprises captures the typical development path of an enterprise from low into high innovation activity and could serve as a reference model for the design of The difference in the numbers derives from the calculation methodology. They refer to an increase in the number of innovative enterprises in the weighted sample with weights for the micro, small and medium sized and large enterprises and in the unweighted sample, respectively.

Factors and Types of Innovation Activity

munications have staff of 10 or more. Another 35,000 – 40,000 display characteristics of viable economic enterprises that could develop through innovation. The remaining (55,000 - 60,000) are a form of self-employment through sole-proprietorships and/or family businesses, which could be transformed into microenterprises through entrepreneurship, but which would most probably not resort to innovation. The sample for the 2008 INA – the survey of the innovation activity of Bulgarian enterprises, presented in the current *Innovation.bg* report, is weighted with regard to the contribution of the various groups of enterprises to the overall turnover of enterprises in the economy, as well to their share GDP (mostly with respect to the three groups – microenterprises, small and medium sized considered together, and large firms). Despite small and medium sized enterprises having roughly the same share in the economy by these two criteria – turnover and value added – small enterprises are boosted in the sample compared to the medium sized ones as regards the ratio of their numbers in the general population.

According to the Innovation Index of Bulgarian Enterprises, for the period 2006-2008 the overall number of enterprises

engaged in innovation has increased by between 3 and 9 percentage points.13 At the same time, 5% of the enterprises (typically micro and small and medium sized) have made no innovation in 2008 since they claim they have introduced sufficient innovations in preceding years. According to the index, by now around a third of the Bulgarian companies (29-34%) innovate each year with 90 % of them having stable innovation budgets, and half having increased these levels in 2008 compared to 2007. Between 7% and 10 % of enterprises innovate only occasionally. There is significant correlation ($r = 0.259$, $p < 0.01$) between enterprise size (natural logarithm of the number of staff employed) and its innovativeness as measured by the innovation index, i.e. typically larger enterprises are more innovative. This applies to all four types of innovation performed by enterprises but with lower correlation coefficients. In 2008 microenterprises performed worst in terms of the gap between their average index values and those of all enterprises in process innovations, while this gap among the small enterprises was biggest

in product innovations. These two groups of enterprises were closest behind the averages as regards marketing innovations, while medium sized and large enterprises lead in product innovations. A micro or medium- sized enterprise is capable of being highly innovative in the Bulgarian environment only if it operates in a high-tech sector, in which knowledge (intellectual capital) is the biggest ingredient and only insignificant investment in long-term tangible assets is needed.

Organizational and product innovations are most prevalent among Bulgarian enterprises. Seventy percent of the innovative companies introduce more than one type of innovation at a time, while 18% perform all – product, process, organizational and marketing innovations simultaneously. The predominant type of innovation evolves with the change in the value of the innovation index (level of innovativeness) of the enterprises. For example, for companies with weak innovation activity ($0 < i < 33$) organizational innovations are the most frequent ones, while marketing innovations policies in support of innovation. Initially,

the enterprise emphasizes organizational innovation (as they can produce substatially efficiency gains at relatively small cost) and enhances the range of its products – product innovations (mostly new for the enterprise for a limited market segment). Next comes a focus on marketing in order for the enterprise to expand its share in existing and new markets, which then inevitably requires a diversification of its product portfolio and an optimization of the business processes and production technologies through process innovations. At the last stage, product renewal at the most innovative enterprises has become so routine that

there are even operational targets for new products for each year. Comparative advantages for the companies derive from process innovations and business model innovations. Although it is possible for enterprises to introduce all these innovation stages in a very short period thus skipping some steps, this involves radical innovation, which can rarely be planned or receive project funding from the state. Government policy should therefore aim at supporting gradual innovation at the appropriate stages of development at company level. The innovativeness of enterprises is determined by a number of endogenous factors (related to the enterprise; factors which it could influence or are the result of its development) and exogenous factors (which cannot be influenced by the enterprise and are characteristic of the environment in which it operates). There are significant correlations between the value of the innovation index and the type of market, in which the enterprise operates (local, regional, national, European, international), as well as its: export profile (share of exports in its overall turnover), size (logarithm of the number of employed staff), age (logarithm of the number of years the company has existed in the Bulgarian market), planning horizon, the quality standard systems it employs, the ERP characteristics of its IT systems, the quality of its website, R&D spending dynamics and the share of employees with university degree. The type of market and the intensity of competition, which an enterpise faces, are the strongest factors influencing its innovativeness. The more closed the market (geographically and in terms of market participants), the less innovative the enterprises. Reaching the international markets requires more effort and capacity from the enterprise and is more exacting on the product, which needs to meet more requirements and

to be in demand on markets with tougher competition and sophisticated consumption. Only a quarter of the enterprises operating on the local markets (within 30 km of the enterprise premises) are innovative, compared with 40% of those selling to the regional market (within 100 km of the enterprise base) and 60% of those operating at national, European or international markets. The average innovation index for enterprises operating mostly in international markets is three times higher than that of the enterprises at local markets and twice higher than that of regional market enterprises. Exporting enterprises (particularly to more developed economies from the point of view of innovation) have access to advanced technological knowledge, which they could absorb, adjust to their needs and develop. This leads to a specific type of learning of enterprises – *learning through export*, by way of which external markets influence the enterprises' innovativeness. This provides the government with an extra reason to support the development of the export capacity of Bulgarian enterprises since it would contribute to both higher short-term

economic growth and sustainable positive effect on the innovativeness of enterprises. The potential beneficiaries of such support would be a limited number of enterprises (less than 10,000) mostly of foreign ownership which have already been integrated in international value adding networks. Still, such a policy could support product innovations leading to the development of networks of local suppliers, partnerships with leading local researchers or enterprises whose services add significant value at some stage of the innovation cycle (R&D, prototyping, marketing). This would lead to a further learning effect of export for a wider group of Bulgarian enterprises, which could in turn develop their own innovations and new export lines. The impact of competitors on the innovation activity of enterprises has been evaluated through the main competitor type – whether its strategy emphasizes cost leadership or product differentiation. As could be expected, enterprises which have competitors with high product recognition are generally more innovative and in particular prioritize product over process innovations, both as regards their numbers and their degree of novelty. The cost leadership strategy requires a stronger focus on process and organizational

innovations leading to optimal costs. The impact of competitors on specific innovation decisions, as well as linkages between the innovation activities of an enterprise and its use of ICTs, are analyzed in chapter 5 of this report. The application or development of quality standards of the ISO, OHSAS, etc, type is an additional factor regarding markets and competition. The application of international standards requires constant effort at all management levels and involves considerable cost. These are applied when the enterprise competes in very competitive markets which have quality standards as an entry requirement. The development of a Quality Management System (QMS) is an organizational innovation and could itself lead to product or process

innovations. Thus, the application of such standards indicates an established or emerging culture of innovation. Enterprises which apply international standards are generally twice as innovative as those which do not. This difference is particularly pronounced for product and process innovations with the average values of the respective index components in these cases being three times as

large. International standards have been introduced also to enterprises competing only on the national market. Partly (e.g. for industry) this is due to regulatory requirements but also to their use as an entry barrier in some public

procurement tenders in the service sector where their application is not mandatory14. The application of a QMS is a long term investment and requires a longer planning horizon, which also stimulates innovative thinking and action. Innovations are a long-term commitment and require a certain attitude, which is not developed over a year or a few months – the range of operational planning. The average innovativeness of enterprises whose planning horizon is three years is 50% higher than that of enterprises whose planning horizon is just one year, rising to 150% for those with 5 year planning span. On the other hand, enterprises which plan for the long-term usually foresee and set microtrends leading to significant shifts in consumer demand and radical product and process innovations.

Globally, leading enterprises develop long term scenarios for 10-20, even 50 years for their sectors, markets and key technologies. These scenarios serve as basis for the design of conceptual models for new products or strategies for operation in an uncertain environment, which are then translated into short term R&D and lab tasks. In Bulgaria, the planning horizon impacts the most process innovations, and the least – organizational ones. At the same time, assumptions about a stable and significant correlation between the innovativeness of enterprises (as indicated by the value of their innovation index) and capital investments (logarithm of the investment outlays and their ratio to turnover), the share of employees with post-graduate degrees, as well as the share of employees trained over the last year, were not confirmed. Capital investments which can be used to finance, if needed, innovation projects are an indicator of the financial potential of the enterprise. A linkage between innovation activity and capital investments could also be expected in the case of intensive enterprise growth where the development of new production processes and products necessitates an increase in tangible assets. The lack of such linkage in the surveyed

enterprises could be explained by the mostly extensive growth pattern of enterprises in Bulgaria. In other words, this results from the expansion of their tangible assets as part of an ongoing process or structural change which are not related to the introduction of any novelty. An additional contributing factor in this regard was the fact that during the past few years Bulgarian industrial enterprises went into the real estate business lured by sky-rocketing returns, as well as that enterprises already operating on the retail market, mostly in garments, shoes and household equipment made considerable investment into an expansion of retail outlets in 2007-2008.

It is a common assumption in innovation literature that enterprises with larger human capital pool have a higher degree of innovation activity.The number of persons with higher education (completed bachelor's or master's degree), with post-graduate degree (which would lead to the assumption that their R&D would be of higher quality) and the level of continued education within the enterprise (share of the staff undergoing additional training) seem like to naturally stimulate innovation. Although there is a strong correlation between the index and the share of persons with higher education in the overall number of employees,

neither those with doctoral degrees nor the continually educated have any tangible innovation activity impact.

While a more detailed study is required to identify the influence of the level of education of the staff on the innovation activity of the enterprises, on the basis of available data it could be concluded that the presence of doctoral degrees do not guarantee an innovative effect on the host institution. This could be partly attributed to input and output problems (applicants and graduates from PhD studies are not usuallythe ones with the highest innovation potential), and partly to the fact that the type of job assigned to those with doctoral degrees rarely matches their skills. This may also result from the fact that the enterprise

does not expect and does not require innovation from its PhDs. Because of the economic crisis and the expected return of around 200,000 people to Bulgaria during the next two years, a sizeable share of them (possibly around 5%, or 10,000) could be expected to be Bulgarians holding PhD degrees who have had problems on the job markets of the US and Europe. The education received in foreign universities could lead to boosting the human capacity at company level in Bulgaria in the subsequent upturn. The lack of noteworthy correlation between innovation index values and the staff that had undergone

training in 2008 could be explained by the prevalent type of training available for the Bulgarian market, which is mostly in soft skills or specialized administrative education (e.g. of accountants on legislative amendments). This, however, only peripherally leads to new technical competencies. Of the factors described above, the enterprise's market, its adoption of quality standards and long term planning and the number of ERP characteristics of its IT systems are the ones that most comprehensively account for the innovativeness of an enterprise. Another possible combination of factors explaining an enterprise's innovativeness, includes the market on which the enterprise operates, its relative size (staff) and the share of employed persons with higher education, the presence of quality standards and the planning horizon. In both cases, however, the rather low coefficients of determination between the models and the data (R2 = 0.214 in the former case and R2 = 0.199 in the latter) indicate that additional factors explaining the innovativeness of the enterprises are needed to explain current trends.

Gross Innovation Product

The gross innovation product of an economy or its innovativeness is assessed by the new products and services introduced, new technologies created and new scientific results achieved. It consists of and results from the interaction of innovation, technological and scientific products of the country. It is a major benchmark for innovation policy because it makes it possible to compare the outcomes of the innovation system in temporal and geographical aspects and to estimate the needs for changes in organizational

and input resources in the innovation process. According to the Eurostat definition an innovative firm is the one that has introduced a new or improved product, service or process for the period being analyzed. Enterprises with fewer than 10 employees are not studied.

Innovation Product

Innovation product encompasses innovation activity in the form of new and significantly improved processes, products and services based on created new and/or adapted existing 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 operation of the national innovation system. The key features of this indicator, its market orientation and the fact that it represents the final stage of the innovation process, predetermines the business's leading role (especially enterprises' innovation activity) for its realization.

Innovative Enterprises and High-Tech Exports

According to the Fifth Community Innovation Survey 2006, published in 2008 based on data for the period 2004-2006, the share of innovative firms15 in Bulgaria is 20% of all industrial and service enterprises16. Therefore, Bulgaria lags substantially behind the average level of the EU-27. For comparison, the share of innovative enterprises in EU-27 is 39%, which means that Bulgaria has almost half of the innovative companies than the EU average level. However, in Bulgaria there is positive growth in the share

of innovative companies, with a 25% increase over the 2002-2004 period, while the share of innovative enterprises

in EU-27 has decreased by 1%. One can look for reasons for the increased innovative activity of Bulgarian enterprises in entrepreneurs' relatively higher awareness of the effect which innovative products and processes bring to a company; increased

opportunities for funding, including European programs and funds; and effective cooperation with foreign companies. Among the EU-27 member states Germany (63%) keeps its leading position regarding the indicator of innovative enterprises share (despite the registered drop of 2 percentage points compared to 2004),

NEW INITIATIVES OF EC FOR FINANCING OF INNOVATION

The European Commission and European Innovation Fund (EIF) offer active use of JEREMIE Initiative (Joint European Resources for Micro to Medium Enterprises) to create new enterprises and expand existing ones17. The Commission pays more and more attention to the important role of microenterprises and mechanisms for financing, adapted to their specific needs.

On September 10, 2008 the Commission and the EIB Group launched the mechanism JASMINE (Joint Action to Support Micro-finance Institutions in Europe). The main objective is to channel different types of technical and financial aid and to support non-banking institutions for microcrediting in their efforts to improve the quality of services offered and to expand by simultaneously providing greater stability. National and regional authorities of Member States can apply to participate in JEREMIE. Small and medium enterprises are not granted direct funding.

SHARE OF INNOVATIVE FIRMS BY SIZE (NUMBER OF EMPLOYEES)

followed by Belgium (52%), Austria nd Finland (51%). Latvia (16%), Bulgaria and ungary (20% each) and Romania (21%) have the weakest innovation activity. A general feature of European economies is the presence of the strongest innovation activity in large enterprises (with over 250 employees). The situation with small and medium-sized enterprises is a bit different. While in Bulgaria only 17% of the small and 26% of the medium-sized enterprises are innovative, their shares are respectively 34% and 52% in EU-27. Over 40% of the small and 50% of the medium-sized enterprises in Sweden and Finland invest in innovative activities. As a whole, the segment of small and medium-sized enterprises (SMEs) in Bulgaria has low labor productivity

and insufficient innovation activity. A large part of these enterprises operate on the local market where customers are not very demanding. In a world financial crisis government efforts are focused on maintaining a stable macroeconomic policy. The increase of innovation activity, however, has a significant role in a long-term plan and in this context investments in company competitiveness have to be guaranteed. Well functioning enterprises are the key to economic recovery. At the same time, the opportunities for funding SMEs are becoming more and more limited, and the situation could get worse because financial institutions are becoming more cautious when granting credits. The demand on the market shrinks and this is a prerequisite for companies to limit their investments, including in innovation projects, which generally are more risky. In this situation access to financing is of great importance, especially for start-up enterprises and SMEs. The analysis of innovative enterprises in Bulgaria and EU-27 by industry reveals that the relative lagging behind of a country centers on the transport, storage and communications sectors (37.03% of European level) and wholesaling and trade intermediation (46.1%). Computer technologies (80% of European level) and extractive industry (87.5%) are the most innovative sectors. The enterprises of the service sector continue to lag behind the average European levels significantly, but a change is observed towards the decreasing of differences. Compared to 2002-2004, there is significant growth of over 5.8% in innovative enterprises, dealing with computer technologies, 6.7% growth in the extracting industry and 5.8% growth for companies involved in production and distribution of electrical and thermal energy, gaseous fuels and water. The rise in the number of innovative enterprises in the above mentioned sectors is due to a great extent to the significant direct foreign investments over the period 2005-2006. Another great part of the direct foreign investments aid the development of Real Estate Operations and Construction sectors. Financial intermediation is a sector

with relatively good positions with. It is possible that the values for ÅU-27 are higher than 12%, as there are no data about Germany, France, Sweden, Ireland, Latvia, Estonia. 60% share of innovative enterprises, compared to the EU-27 average level (despite the drop of 2% compared to the former studied period). According to the type of innovations, the analysis of innovative enterprises in Bulgaria over the period 2004- 2006 shows the preservation of the share of 7% of companies introducing new products. The share of those introducing new production processes increases fourfold (from 1% to 4%). Nevertheless, by this indicator Bulgaria is among the countries with the lowest share of companies introducing process innovations, along with Romania and Hungary. About 8% of all Bulgarian enterprises introduce parallel product and process innovations at an average level of 16% for EU-27 (an increase of 1% in comparison to the former period). Cyprus (29%), Germany (27%) and Austria (25%) are the leading countries in Europe by share of companies with mixed innovations, followed by Estonia and Luxembourg (23% each) and Finland and Belgium (22% each). Germany with 19% of all enterprises is a leader in product innovations in EU-27, while Portugal has the greatest share of enterprises with process innovations (16%). It is important to find out to what extent process innovations support and supplement product ones. A number of studies show that process innovations can be carried out without being directly connected to product innovation. In traditional industries, for example, process innovations are usually introduced for cutting labor costs or production rationalization. In the sectors of computer technologies, R&D, architecture and engineering Bulgaria has twice as many product innovations (20% of enterprises) compared to the EU average level of

14%. In the sector of trade and trade intermediation in the EU-27 and Bulgaria, the share of product innovations is close (6% and 5% respective-

As far as process innovations in this sector are concerned, however, there are still significant differences. In spite of the threefold increase of companies introducing new methods of distribution of goods and services, the values for Bulgaria are only 4% of the EU average level of 12%18. In view of the difficult situation in which the construction sector is at the moment, a drop of product innovations can be expected next

INNOVATIVE ENTERPRISES IN BULGARIA AND EU-27 BY SECTOR

The names of the sectors are shortened for clarity. year in architecture and engineering which are related to this sector. Research shows again that financial reasons are among the main factors hindering firms in carrying out innovation activities. The high costs of innovation are given as a basic reason for lack of innovation by 24% of Bulgarian companies and the percentage is the same with the EU-27 countries. An impeding factor next in importance is the lack of spare funds in the enterprise itself. The insufficiency of in-house financial resources is a result of high expenses which businesses have to have to maintain the necessary equipment because of both old production equipment and the poor conditions of premises. An essential

problem is the huge inter-corporate indebtedness of enterprises. A third reason underlined by 15% of the innovation firms in Bulgaria, is the lack of proper sources of financing. About 18% of European entrepreneurs give the same argument.

Compared to the former period, this indicator is relatively less important. There is an interesting phenomenon – the percentage of firms which have difficulties in finding highlyqualified personnel is on the rise. This trend has been in existence in Bulgaria for several years and continues to intensify. Having in mind the Eurostat data, it is clear why the personnel problem exists and is becoming more and more serious – only 29% of enterprises' innovation activity is directed to training (in the EU

countries it reaches 52%). An important aspect in the analysis of companies' innovation activity is studying their information sources. While for the period 2004-2006, enterprises rely only on their own research and analyses, in 2008 clients and consumers are a main source of information for 36% of them. Companies carrying out innovation activity appreciate the role of end consumers in the market success of new or improved products. A similar orientation of innovation activity to consumers' needs and requirements is in unison with the opportunities for process and product renovation of modern companies under the conditions of financial and economic crisis. The limited financial resources do not allow carrying out large innovation projects connected with the development and adoption of entirely new products, application of new technological knowledge and the creation of new needs. Most innovations are limited to different stages of perfecting products and improving technical and economic characteristics of the production process (mainly in the direction of looking for opportunities to cut expenses). In this sense, knowing market trends minimizes the risk of their investment. Suppliers form part of the technological chain and are, in many respects, a limiting factor in the organization of a production process. They remain an important source of information and ideas for directing a company's innovative activity. Besides, firms demonstrate a widening horizon when it comes to new knowledge access channels. Conferences, trade fairs and expositions, scientific magazines and technical publications are used more intensely, which shows that they are seeking closer linkages to the achievements in the respective scientific and technological fields as a basis of product and process innovation. What is worrying is the fact that only 4% of the firms rely on universities and 1% work with state and public institutions to obtain information about new trends in their fields. There is only higher activity concerning the use of services of consulting companies – 11% of the firms regard them as a reliable source of information. The type of specialization of the Bulgarian economy is best represented by the share of high-tech export in the aggregate commodity export of the country. These statistics reveals the low technological profile of the Bulgarian economy, in spite of the positive trend. The conclusion is that the Bulgarian innovation system is not directed at creating products with high added value content, unlike, for example, Hungary, which since the beginning of 1990 has pursued results-oriented policy in this direction.

Characteristics of the Innovation Activity in Bulgarian Companies

For the period from 2004-2006 the highest percentage of innovative Bulgarian companies (73%) recognize

machinery acquisition, equipment and software as the main innovation activities; 29% believe staff training to be a leading factor and 22% attribute innovation to the introduction of products and services to the market. No demand for innovative products; Lack of own resources; Absence of appropriate sources of funding; Excessive innovation costs; Lack of qualified staff; Lack of information about technologies; Lack of information about markets; Lack of appropriate partners for innovation; Market dominated by established companies; Fluctuating demand for innovative products and services; No need for innovation due to already introduced innovations. The proportion of companies which conduct R&D (13%) or get studies and research from research institutes, universities and private labs (9%) is strikingly low. This shows the relatively low level of scientific and technological novelty of the accomplished innovation projects. While in Europe 28% of the enterprises conduct R&D (which is a precondition for the presence of research labs and skilled workers) hardly 2% of the innovative Bulgarian companies can afford such an investment19. In 2008, there was an additional drop in these indicators. By investing in innovation activity, Bulgarian companies are striving both to perfect the quality of their products and services (48%) and for a wider range of goods (33%).

The next most important reasons include compliance with internationally acknowledged standards (31%) and entering new markets (29%). In terms of the new regulations of the European market related to ensuring stable growth, there is an increase in the share of innovative projects that are oriented either to environmental topics or to providing safe work conditions.

It is an invariable trend which is to remain in the coming years and is directly connected with Bulgarian membership in the EU.

The lack of adequate and appropriate sources of financing is still one of the main obstacles to company innovation activity. This problem is to intensify due to the financial crisis. The government's efforts in the field of research and innovation might turn into a challenge in the present credit crisis and corresponding public funding decrease. Nevertheless, mechanisms should be found for guaranteeing a stable investment environment, including the goals of product and process renewal. EU-27 Bulgaria: Entering new markets or enhanced market share; Greater quality of products and services; More flexible production and delivery of services; Enhanced production capacity Increased range of products.

Management Systems and Innovation

The logic of international standards for management systems20 is in working out rules which, besides controlling processes and product quality, provide continuous improvement of these processes, products and services. Management systems can be viewed as a minimum requirement for creating sustainable internal environment for work and management which preserves the established positive practices and at the same time encourages innovation. Thus, certification, besides being a form of organizational innovation, can be viewed as an investment in management improvement and control which provides motivational factors and incentives for creating a sustainable innovation environment. Certification is still used as an instrument of "legitimizing" good managerial practices in transition economies and in developing countries, which have the highest rates of such practices. In developed European economies and the US, the market is comparatively saturated and there is no such growth there. National governments have a different attitude towards certification and in many countries the imposing of certification as a requirement is a strong external incentive for investments in this sphere. It is interesting to note the correlation between the number of quality certificates and environment certificates issued. It is indicative of priorities which businesses (and in some cases indirectly, the government through regulations) set regarding management. While in Japan for every 4 quality certificates granted there is one environment management certificate, in the developed European economies the ratio is 10:1, and in Bulgaria it is 20:1. The average annual rate of growth of certificates granted in Bulgaria is 30-40%. It is possible that the expectation for this rate to remain stable into 2009 will not occur because of the global financial crisis. The data for the distribution of certificates by sectors and standards outline a couple of main trends:

• Bulgaria is not an exception from the world trend of SMEs using certification as an instrument of "legitimizing" their managerial practices and creating confidence in their clients and partners. Nearly 80% of the organizations certified in Bulgaria fall in the category of small and medium enterprises, most of them manufacturing products or offering services on the local market. • Certification is undertaken mainly in organizations for which the requirement was introduced by regulations or which participate in public tenders. According to the distribution of certificates by sectors, the construction sector and sectors related to it are among the first in certifying by types of standards – quality, environment and occupational health and safety. This can be explained by the high risk associated with their work, as well as with the requirement for such certificates in almost all tenders for public orders. Thus, practically, for this sector these certificates are "voluntarily compulsory" – they are an explicit condition for the operation of businesses and getting new contracts. • Another large group of economic agents operate in sectors where market leaders are certified and this makes the other enterprises also aspire to provide competitiveness through certification. In our country this is characteristic mainly of enterprises which compete on the Bulgarian market in the sectors of construction, transport, real estate, hotels, communications, information technologies and the food industry. Separate attention should be paid to the introduction of certification in the structures of state administration and local authorities. In Club 9000's register as of December 31, 2008 a total of 98 organizations are registered under the title "Public Administration". 100 communal administrations are expected to join them, which will take Bulgaria's state administration to one of the leading places by number of received certificates. This comparatively "mass" certification in the public administration sector is in a way a Bulgarian phenomenon. Except in Japan, where almost all structures of local and state authorities are certified, in most European

countries as well as in other parts of the world, certification in this sector is chosen by some administrations. The data register the valid certificates as of December 31, 2007. Certificates are issued for a period of three years, some organizations do not renew them, some give them up, and some are deprived of them. These data are the only available formal information, which is gathered in a structured way. The voluntary principle of reporting and participation in the ISO study doesn't guarantee complete data. 22 In Denmark all enterprises, certified under OHSAS 18001 (Occupational health and safety management systems), are

exempt from being checked by the Labor Inspection Agency. In many European countries this certification allows for reliefs in insurance contracts, access to credit resources, etc.

Technological Product

Technological product is a result of the creative activity of various participants in the innovation process. It has unique characteristics and economic significance, which makes it attractive as an object of transfer. The most frequent form of protection of technological products as intellectual property is their registration as inventions and utility models. The analysis of applicant and patent activity regarding inventions and utility models in the country 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 find ways for improving it.

Two main issues need to be highlighted in relation to applicant and patent activity when registering inventions and utility models within the territory of the country in the last few years. The first one is connected to changes in the European Patent Legislation (e.g. about biotechnological inventions) which had to be adopted in Bulgaria by mid-2000. The second one relates to Bulgaria's membership in the EU, which led to other legislative changes becoming effective (e.g. protection of medicinal products).

This analysis, therefore, studies the trends in the protection of technology products on a broader scale, covering the period of 2000 to 2008. Special attention is paid to the activities of firms, individuals and research institutions creating technological innovations from 2006-2008, compared to the values of indicators studied during the pre-accession period and the years of membership. The main information sources of the study are the publications of applications and patent licenses in the Bulletin of the Bulgarian Patent Office (BPO), as well as BPO's annual reports and statistics.

Protection Documents Granted for Inventions and Utility Models

There is a trend toward decrease of inventions patents granted according to national regulations for the period 2000-2007. In 2008, there was an increase in the number of patents granted to Bulgarian persons. As this is the last year of the studied period, it is difficult to determine whether this increase is the beginning of a positive trend or it is accidental. Applicants' activity and decreasing number of patents granted to foreign persons could be due to our country's accession to the European Patent System. For the whole period 2000-2008, the data about utility models show relative stability in the number of protection

documents issued according to national regulations in favor of both Bulgarian applicants and foreign ones. Only in 2008 was there an increase in their number. The protection documents for inventions and utility models according to national regulations in 2006 are 386, in 2007 – 300, and in 2008 – 455. The comparison of data for submitted applications and patents issued show that Bulgarian applicants are more often rejected invention patents than foreign applicants. As far as inventions are concerned, a smaller part of documents are owned by local persons (below 30%). Among Bulgarian holders, individuals have the greatest share (68%). Technological products protected by individuals are often created with resources of the organizations for which they work. Since organizations are often not interested in protecting new knowledge, individuals apply independently and get protec-

Bulgarian persons filed 47 patent applications, and in 2007 – 55. The patents granted to Bulgarian persons in 2006 were 4 and in 2007 – 7. For comparison, there were years in which Bulgarian persons filed applications and "received" patents several times more than now. It must be noted, however, that the persons to whom patents were granted were individual inventors and not organizations26. This definitely puts in doubt the way the innovation system operates in Bulgaria, and puts forward the need of stimuli in creating, introducing and using technological products by companies. The data of the European Patent Office and the

United States Patent and Trademark Office make it clear that Bulgarian persons need schemes to aid them in patenting on foreign markets. According to the International Property Rights Index Bulgaria has improved intellectual property protection on its territory. Transfer of technological products is an important channel for the adequateuse of their potential. The survey by the Applied Research and Communications Fund of the innovation activity of Bulgarian enterprises INA-3 confirms the results of previous analyses that Bulgarian companies are not familiar with the opportunities and variety of forms of purchasing and selling intellectual property objects and refrain from participating in them. Nearly 40% of respondents believe that the lack of reliable intellectual property protection has a negative impact on innovation activity, despite the fact that Bulgarian legislation is almost completely harmonized with the international standards in the field of intellectual property.

THE DEGREE OF INTELLECTUAL PROPERTY PROTECTION FOR BULGARIA AND THE REGIONS OF CENTRAL AND EASTERN EUROPE AND RUSSIA, AND WESTERN EUROPE

Another aspect of the problem is that the effective intellectual property protection requires modern legislation and regulations as well as effective enforcement, including a well functioning judiciary. This part of the system for intellectual property protection in Bulgaria faces some problems and does not sufficiently guarantee the interests of rights holders. The need of improving the functioning of the judiciary is not new, and one of the ways to do this is to create specialized courts or judicial panels on intellectual

property. Bulgarian companies offer for sale the rights of their intellectual products only as an exception. The insignificant number of transactions for buying licenses and trademarks is their only participation in the market of technological knowledge as buyers. Thus the lack of well-developed research units within the business sector does not allow the creation of their own sources of technical innovation. Besides, by abstaining from technological transfer the firms have no access to technologies already created and introduced. This makes the discrepancy between Bulgaria's technological level and that of the developed economies practically insurmountable.

Research Product

An important precondition for raising the country's innovation activity is the new knowledge created by its scientific organizations and scientists. An analysis of the dynamics and structure of this process reveals Bulgaria's potential to enter successfully the world's research networks, the country's relative advantages in different spheres of knowledge and its ability to compete successfully on the market of intellectual products. Regional and European comparisons are particularly important with a view to Bulgaria's participation in the European Research Area along with the other EU member states.

Institutional Aspects of the Creation of a Research Product

The data of Web of Science for 2007 show that the irregular participation of Bulgaria's research organizations

JOINT AUTHORSHIP PUBLICATIONS IN BULGARIA IN 2007*(N=2,728)

* the marginal value is 1% of the total number of documents. All documents are included. The scientific articles and materials from conferences comprise 86.66% of the total number of documents; 9.38 % are summaries of reports.

** England, Scotland, Wales and Northern Ireland are presented separately in the database.

Channels for Research Product Distribution

The various channels for scientific product distribution contribute differently to its international visibility; because of this, the choice of a channel is of strategic importance both for scientists and scientific organizations. On the whole, over the past years a positive development has been observed in the structure of the communication channels for distribution of Bulgaria's research product. The second inclusion of the *Proceedings of BAS* journal ("Compte Rendus de l'Academy Bulgare des Sciences") in the list of the referenced editions of the Web of Science base has a positive effect on the number of publications from Bulgaria in it. In 2007, 6.31% of the Bulgarian publications (172 in total) came from this journal31. Journals published in the country worth mentioning are *Biotechnology and Biotechnological Equipment and the Bulgarian Journal of Agricultural Science,* with 3.53 % and 1.66% respectively, of the total number of Bulgaria's publications. Over the last years the dynamics in the main international information bases has been of great importance for the country's publication policy. In 2006 a considerable expansion of the Web of Science was carried out as regards the referenced journals and 700 of the so called regional journals which meet Thomson Reuters's32 selection criteria. A basic argument in favor of this expansion is the increased importance of the regional problems and the role of science in solving them. The new journals completely integrated with the existing database. 386 new magazines from Europe were included. Bulgaria has 6 new magazines, considerably fewer compared to other countries, such as Croatia, Romania, and Slovenia, which is comparable to it in a number of indicators of their potential. This expansion provided better visibility for magazines in the area of social and humanitarian sciences. Unfortunately, Bulgarian magazines in these areas are not included, unlike Croatia (6), the Czech Republic (4), Hungary (4) and Romania (1). The country's research product presented at scientific forums (conferences, congresses, seminars) should be evaluated with a view to the advantages of this communication channel: its efficiency, opportunity for direct communication, inclusion in networks and expansion of cooperation.

Although in this case the annual dynamics of publications by areas is generally dependent on the regularity of respective forums, the participation of Bulgarian scientists in them indirectly reveals their activity and capacity for research. The greatest number of publications is received by the participation of our scientists in conferences, schools and seminars in the areas of: condensed matter physics, plasma physics, laser physics, numerical methods and applications, current methods of calculation, and nanotechnologies. In 2008, Bulgarian participation was registered in 383 conferences, as the publications from the participation of Bulgarian scientists in scientific conferences in the area of medical sciences, solar-earth influences, oceanology research, telecommunications and space technologies had a high relative share. The data about the research product over the last years show that Bulgaria keeps its position in world science thanks to its active international scientific cooperation, expressed not only in the total number of published papers but also in joint authorship publications. This is also due to the considerable enlargement of the main databases on research publication activity on a world-wide scale. Publishing in renowned international journals retains its paramount role as a communication channel. Significant opportunities are also exist for national publications which face the task of raising their quality in conformity with international criteria. Entrepreneurship and innovation networks are the main linking elements in the national innovation system. Entrepreneurship is embodied by startups and initiatives undertaken to expand business and implement innovation projects. Innovation networks are the channels and forms of interaction and exchange of information among the stakeholders in the innovation system. Entrepreneurship and innovation networks determine the viability, adaptability and

flexibility of the national innovation system. The creation of an entrepreneurial spirit and stable innovation networks inside and outside the country should be among the main goals of the national innovation policy.

Entrepreneurship and Innovation Networks

Entrepreneurship is identified as an important driving force for economic growth, productivity and innovation. Entrepreneurial practices provide dynamics, flexibility and adaptability for national economies. Companies enter the market, operate under given circumstances and are replaced by new companies that manage to reach higher effectiveness when environmental factors change. Entrepreneurship policies are closely related to innovation polices. Measures stimulating the creation of new enterprises encourage the introduction of innovative processes and products in their practices. On the other hand, the growth of scientific research and the introduction of results obtained through innovation create new fields where entrepreneurial skills can be developed. Indicator analysis concerning the number, structure and density of enterprises shows that entrepreneurial activity in Bulgaria is still increasing. The number of SMEs increased by more than 2.1% in 2006 in comparison to 2005 and reached 257,142. The main stimulus for that economic upturn has been macroeconomic stability, positive expectations referring to Bulgaria's EU membership and various EU programs that facilitate Bulgarian business. Over the last years, there has been a trend towards restructuring inside SMEs. In 2006, the percentage of micro-enterprises went down by 0.8% while the SMEs share increased because they are larger in size and have higher innovative potential. Polices and measures aimed at supporting entrepreneurial activity in Bulgaria should be oriented towards two main spheres of influence: • to encourage registration of new enterprises, including the high-tech sectors of the economy; • to facilitate the survival and further development of start-ups.

The elimination of all institutional barriers that are an obstacle to starting and doing business is recognized as one of the main tasks of the state institutions. Despite the fact that in 2008 there was a tendency of improving the conditions for entrepreneurial activity, it is still more difficult to do business in Bulgaria than in most EU member states. In 2009, Bulgaria has moved a position up (reaching the 45th place among 181 countries) in the ranking list of economies with the most favorable legal and regulatory environment for business. Although the country has facilitated entrepreneurs in starting up or winding down a business, paying taxes and meeting contract obligations, it has complicated the legal and regulatory regime for granting construction licenses.

Having in mind the difficulty in obtaining all the necessary building permits, tax payments, and doing import and export, Bulgaria lags behind most of the countries studied and takes 117th, 94th and 102nd place respectively. Despite all the positive changes in Bulgaria, some of the new EU member states (Estonia, Lithuania, Latvia, Slovakia and Hungary) are higher up in the same ranking list. More obstacles to doing business than in most EU Member States can have a negative impact on the ability of Bulgarian enterprises to survive and grow, to be competitive and to develop their innovative potential. Policies and measures for encouraging start-up enterprises should not Doing Business in Small Island Developing States 2009, The World Bank, http://www.doingbusiness.org A number of theoretical models and empirical studies show that the presence of positive entrepreneurial attitudes and intentions are the main prerequisite for entrepreneurial behavior.The main risks that these

companies face are:• reduced access to financing by banks, leasing companies and other financial institutions. This will hamper investments in new equipment, new projects and activities; • lower demand on the internal European market and a drop in

prices of some products and services. This can endanger the survival of companies whose export is bound by shrinking markets;

• slump in some sectors of the economy such as real estate transactions, construction, etc. This will have a serious effect

on new and small companies in these sectors of the economy as well as on networks of suppliers and subcontractors, including

mainly small companies; • higher risk profile of the Bulgarian economy for outside investors that may lead to reduced foreign investments and outside financing. The country has to adopt a much more active attitude towards assisting the survival of new and small Bulgarian companies. The possible measures in this direction include providing easily accessible financial resources for SMEs; directing state expenditures to the most affected sectors of the economy; making the access of new and

small companies to public procurement tenders easier; and providing more information and advice regarding the opportunities for participation in European projects and programs.

Innovation Networks and Information Sources

Innovation networks include the channels and forms of interaction and information exchange among participants in the innovation system. The intensity and the instruments for information exchange within the network determine the capacity for implementing innovation projects on behalf of individual participants and the innovation system as a whole. The participants in the innovation system in Bulgaria are not able to coordinate their efforts in defining priorities and implementing the innovation

policy measures. The result is limited innovative activity of the individual units within the system and unused innovation potential of the national economy. The link between universities, the Bulgarian Academy of Sciences and business is unstable

and weak, which in turn hampers the introduction of new knowledge, created in the country, and adequate participation in the transfer of already existing knowledge. Bulgarian companies are comparatively poorly integrated in the global production chains. In 2007, the direct foreign investments in Bulgaria reached their peak – 22.6% of GDP. Despite this trend, the economy of

the country remains poorly integrated in the global economy. An explanation could be sought in the fact that this growth is due mainly to the sectors "Real estate transactions", "Construction" and "Financial intermediation". According to the Index of Globalization, which is a synthesis of the economic, social and political globalization of the countries, Bulgaria ranks 44th among the globalized countries and 42nd regarding economic globalization. A comparison between the results of surveys of innovation activity of Bulgarian enterprises conducted by ARC Fund in 2005 and 2008 shows that when developing innovative products and processes Bulgarian business relies more on its own efforts than cooperation with other organizations. The share of innovative

enterprises developing product innovations on their own increased by about 10% in 2008. As far as process innovations are concerned, the share of enterprises which rely primarily on their own efforts increased by about 6%. In 2008, the cooperation between Bulgarian enterprises and foreign and local organizations in the process of developing innovation products

and processes decreased for both joint developments and the commissioning of innovation activity (2% and 1.7% respectively). Regarding process innovations, there is a decrease by more than 8% in companies that work together with foreign

partner organizations and by almost 4% in those that cooperate with local organizations. The share of economic agents that

assign development activity to foreign organizations is decreasing by 3.8% for innovation products and by 2.7% for the innovation processes. The share of companies that commission development for innovation products to other local organizationsis decreasing by about 2%. Regarding the development of innovation processes, this decrease is even bigger

– 2.8%. Only 19.9% of the organizations interviewed have cooperation agreements for innovation activities with local companies and 17.3% with international ones. The reasons for the decrease in trust in partner organizations in implementing innovation activities are different for each particular case. Some companies avoid joint work in order to benefit alone from the results

obtained. Most of the companies, however, do not appreciate the advantages connected with their participation in innovation networks. Some would like to participate but cannot find suitable partners and thus they are forced to develop innovative

products and processes on their own. Nearly 12% of the companies interviewed admit that the lack of partners hampers their innovation activity. Insufficient cooperation in the implementation of innovation projects might be full of dangers related to the unilateral acceptance of the risk connected with innovations; the impossibility to create considerably new products and processes; the limited access to specific competences or foreign technologies. Since 2003, there has been a tendency for the innovation cooperation in Bulgarian enterprises to be rather market oriented than technologically oriented. Dominating are the companies indicating that their clients (35.1%) and suppliers of equipment, materials, components and software (32.4) have decisive significance for their joint innovation activity. A number of the organizations interviewed (23.3%) regard other enter. For more information see Annual report on the state and development of the national policy in the sphere of innovations, 2007, Ministry of Economy and Energy. prises within the same company group as a significant partner. The share of Bulgarian enterprises that assess their competitors, private research institutes and consulting organizations as important partners has increased in comparison to the share in 2005. At the same time, the number of companies that appreciate the importance

of universities, state research institutes and big international companies for the implementation of joint innovation projects is considerably decreasing. It is necessary to improve the cooperation between the research sector and SMEs, which as a

whole implement or assign research and development work more rarely than large companies. This could be achieved through the creation of special market-oriented groups in universities and state research institutes, which would communicate with the enterprises and analyze their specific needs and demands. Such structures would facilitate the mutual access and communication between enterprises and scientific organizations and would assist the universities and research institutes to realize their scientific product on the market more successfully. As a number of surveys reveal, Bulgaria has traditions of conducting high quality research, developing a good scientific product at prices lower than the average prices in EU and there

are some examples of partnership between business and publicly financed research organizations in some industries and regions. The participation of educational institutions (universities and the Bulgarian Academy of Sciences mainly) in the innovation activity has been improving (stimulated by the National Science Fund and the National Innovation Fund), but is still at a level far lower than their potential. Bulgarian entrepreneurs still tend to use mainly market sources of information

to implement their innovation projects. More than 40% of the enterprises studied point out that their customers and consumers are an important source of information for their innovation activity and nearly a fourth of the companies define their suppliers or competitors as such a source. The importance of the other enterprises within the same group or the parent company has

significantly decreased in comparison to 2005. There has been a tendency of a decrease in the share of Bulgarian enterprises that point out universities, colleges, research institutes and private research/technological centers as significant sources

of information for their investment projects. Almost 70% of the Bulgarian enterprises haven't used these organizations as a source of information for the implementation of innovation projects, and companies that assess them as significant represent

less than 3% of all enterprises. These facts show that the link between research organizations and business in Bulgaria is very weak. The lack of market orientation among research organizations reflects unfavorably on the nature and quality of the innovation activity in Bulgarian enterprises (mainly routine innovations, oriented towards the local market). The importance of some

information channels has partially changed in comparison to 2005: in a comparative aspect the share of internet and electronic media is increasing; the importance of printed materials and journals, exhibitions, fairs, and trade events is decreasing.

The internet is still the main media information channel. The access to the global network is of great significance for over 53% of the Bulgarian enterprises. The relative importance of the European institutions is increasing. At the same time the importance of the state institutions as a source of information is slightly decreasing. However, about 60 % of the organizations interviewed stated that they haven't used these sources of information.

The experience of the OECD countries shows that the government policy could play a key role for improvement of the country's innovative performance by creating favorable framework conditions and adopting policies for overcoming the specific market or

system shortcomings. In this context Bulgaria should try to use adequately the opportunities given to the country through increased EU funds for research and innovations for the period until 2013.

Geography of Research and Innovation Activity in Bulgaria

Bulgaria has a small economy and can strive for competitiveness only in certain priority fields of science and technology. High levels of regional divergence are observed in the country – a well-developed region around the capital city Sofia (Southwest

Planning Region), and lower growth rates in the other planning regions. Regional differences are still considerable despite progress in institutional modernization, investment in regional development and economic growth. To a great extent this result

is due to the geographic concentration of foreign direct investments. The analysis of economic, social and research aspects shows considerable differences between the regions. The Southwest Planning Region (especially the capital city) plays a disproportionately important political and economic role that is expressed in a high share of GDP per capita, employment in high-tech sectors and expenditures for R&D. GDP per capita and the budget expenditures for R&D are 1.5 times higher than

the average for the country. The Southwest region is distinguished for high concentration of universities and colleges.

In that sense, Bulgaria can be viewed as a scale model of the EU regarding the asymmetrical distribution of welfare.

The unbalanced development between advanced and underdeveloped regions limits the EU competitiveness. The same problem and the same consequences are reported in Bulgaria as well. This fact, to a great extent, explains not only the low percentage

of innovative companies, but also the weak link between individual innovation partners. Without polycentricism (at least one well-developed city per region that can be regarded as a power of attraction for investors) it would be difficult to achieve steady prosperity. What is meant in this case is not simply redirecting funds to poorer regions, which is an approach for resource

redistribution, but a focused state policy based on the recently developed

Regional Innovation Strategies by regions of planning and state investments in innovation infrastructure: – universities, innovative SMEs and dynamic start-ups. Regions need focused guidance of interaction between industries, research institutes and universities located on their territory. The pure administrative approach should be applied in combination with traditionally developed unique regional advantages as is the case of border regions of Bulgaria, Greece and Romania. The current difficulties (lack of unification of educational systems, non-recognition of diplomas, administrative problems, and difficult communication) are not insurmountable and all border regions should combine their efforts to achieve the EU goals for a Europe without borders and developing of knowledge-based economies. The Baden – Wurttemberg initiative suggests opportunities for cooperation for the creation of a Danube alliance, similar to the Mediterranean alliance and the North dimension (for the countries in the Baltic Sea region). This initiative aims to improve transnational and interregional partnership among the ten countries located along the river, improving the infrastructure and preserving the natural diversity. The Danube River R&D expenses (% GDP), 2005 GDP per person, PPP, EU-27=100, 2005 Employment in the high tech sectors, 2007 Human resources in science and technology, 2007;

Investment and Financing for Innovation

Investments in innovation are the funds spent on creating (or adapting) the innovation, technological and/or research product in the country. They are mainly used to cover the expenses for research and development activity (R&D). Investment in innovation depends on the functioning of the whole innovation system, yet they are most closely related to the presence of various funding mechanisms and tools, including venture capital. The government's direct financial commitments to R&D make this field an important pillar in the national innovation policy.

Public Financing for Research and Innovation

R&D and innovation funding in Bulgaria is implemented by direct budget subsidies, indirect budget support, financial

schemes within the Cohesion and Structural Funds, financing under EU programs and private funding on the part of

banks and businesses. Direct budget subsidies include institutional financing for the Bulgarian Academy of Sciences and the universities, transfers to those ministries in which structures there are scientific organizations, program-oriented financing for the

National Science Fund and project financing for the National Innovation Fund.

The indirect budget support is in the form of membership fees in different international programs such as the Seventh Framework Program (FP7) of the EU for scientific research and technological development, and the Competitiveness and Innovation Framework Program (CIP). For 2007-2013, financial support from the Cohesion and Structural Funds for advancing science and innovations is available under Operational Programs "Human Resources Development" and "Development of the Competitiveness of the Bulgarian Economy".

Public funds for science and innovation continue to be the main source of financing in the country. Businesses have a very small share in supporting research and innovative projects, which places Bulgaria at one of the bottom positions among EU member states according to this indicator. Europe remains far behind the objectives of the Lisbon Strategy related to funding research and development activities. The share of investment in R&D at 1.83% of GDP is significantly below the planned 3%. The member states with the highest intensity of R&D expenditure are the Scandinavian countries with over 3% of GDP, and they keep a leading position in the European rank list (Sweden – 3.63%, Finland – 3.38% in 2008) followed by Denmark (2.54%), Germany (2.53%) and Austria (2.64% in 2008). Among the new member states, the fastest increase of funds allocated for R&D is registered in Slovenia and the Czech Republic, reaching respectively 1.53% and 1.54% of GDP in 2007, which brings them the closest to the average EU level by this indicator. Cyprus, Bulgaria and Slovakia spend less than 0.5% of GDP on R&D. In the period 1998 – 2007, R&D expenditure of EU-27 increased by 2.2%. The change for Bulgaria is nearly 16% downward. Germany, France and the UK form two thirds of the R&D investments in absolute amounts at average growth of the annual basis by approximately 2%. Romania and Estonia mark the biggest increase in the absolute amount of the spent funds (more than 20%), which is reflected in their percentage within their GDP (up to 0.54% for Romania and up to 1.19% for Estonia in 2008). The figures are indicative of the effort the two countries are making to catch up with the average EU levels and meet the Lisbon objectives. Another major part of the efforts of the EU member states is connected to a change in the structure of R&D spending by institutional sectors. In 2005, 54.5% of the total financing for R&D was provided by businesses, which is below the projected two thirds in the Lisbon Strategy. At the bottom of the 2006 list are Cyprus (15.9%), Lithuania (24.5%), Romania (30.4%, which goes down to 26.9% in 2007), Bulgaria (30.6%) and Greece (31.1%) with the lowest degree of participation of the businesses in R&D funding. For the EU-27, higher education is the second most important sector viewed as a source of investments in R&D after businesses. In a number of countries, among which are Bulgaria, Romania, Hungary, Poland, Slovenia, Slovakia, Russia and China, a leading sector with R&D financing remains the state, mostly due to the interventionist traditions in implementing state policy, including the R&D field. Outside of the EU, businesses remain the most involved in creating new knowledge and applying it further. In Japan, 76% of all R&D activities are financed by business, while in the US the percentage is 64. China registers levels close to those in the developed countries (67%). In Bulgaria, the structure of expenditures by economic elements in 2006 remained unfavorable despite the small improvement over the past tenyear period. Current expenditures amount to 88.7% of the total expenditures for R&D, while only 11.1% are allocated for the acquisition of tangible fixed assets (a 1% decrease compared to the previous year).

National Science Fund (NSF) The tendency toward increasing project financing at the expense of institutional financing in Bulgaria is accompanied by a increase in the amount of public funds for science. The NSF budget for 2008 was 60 million levs, which is nearly four times more than the previous year (15.9m for 2007). The aim for the R&D expenses as a share of the GDP is to increase each year by minimum 0.1 percentage point of the GDP, in comparison to the prior year's amount, until they reach 1% of GDP in 2013. The Enterprises, 30.6 Abroad, 6.49 Private non-commercial organizations, 0.37 Higher education, 0.67 Government, 61.86 allocated funds for the NSF for 2009 are 100 million levs. In 2008, the ratio between institutional and program financing reached 35 to 65% (having been at 90 to 10 in 2004). In Bulgaria, scientific research is conducted predominantly by public scientific organizations: the Bulgarian Academy of Sciences, the Academy of Agriculture and the universities. Their funding, for the most part, is institutional. Project financing as a share of these structures' resources is still insufficient. Despite the diversity of research organizations and universities across the country, the funds allocated on a competitive basis through the NSF tend to be absorbed by few scientific organizations. These entities successfully combine different sources of financing, both public and private, on different levels – national, regional and European. The number of private structures conducting research is still small and those who use or demand scientific services are only a few.

PROGRAM FIELDS AND INITIATIVES OF THE NATIONAL SCIENCE FUND IN 2008

The National Science Fund works on 16 competition schemes. 1,050 project proposals were submitted during the open procedures in 2008 (20% more compared to 2007), the applicants being the higher education schools, the institutes of the Bulgarian Academy

of Sciences, non-profit-making organizations and companies. The forecasted average cost of the projects submitted in 2008 is around 200,000 levs. For the first time in 2008 a competition for centers of excellence was announced which aims to pool the research infrastructure and concentrate scientific potential in several big research institutions.

Another development in the Fund's work is the first ever competition for integrated university research units for conducting complex activities, e.g. research, training, technological advancement and innovation activities. In 2008, there was a strong emphasis on human resource development in the research field. Six competitions were launched, all targeted at supporting

young and proven scientists' career and qualifications in science. A new 2008 development is the "Ideas" competition which supports fundamental research and allows the stimulation of innovative and original research creating new opportunities for developing a given scientific field.

National Innovation Fund (NIF) The National Innovation Fund has been created in pursuance of the Innovation Strategy of the Republic of Bulgaria. Potential beneficiaries of the its financial support are all manufacturing companies which upgrade their product and technological structures and seek to strengthen and expand their existing market positions as well as enter new markets. 320 contracts were signed in the first four competition sessions in 2005. The negotiated subsidy amounts to more than 48 million levs. The NIF regulations require businesses to cofinance 50% of the total cost of the approved projects. This resulted in the Fund's support of investments of about 100 million levs for innovative activity. NIF's fifth competition session is subject

to the alterations in the competition rules introduced in April 2008, the most important of which are: • The extra funding for small enterprises added to the basic intensity of 50% support for scientific and applied research projects reaches 20%, rising from 10% in the previous sessions. • Within the technical-economic research areas two task types were introduced: industrial development

and experimental development. • Support for testing should increase from 50% to 75% for SMEs and to 65% for big enterprises.

The firms' growing interest in the competitions launched under 'Operational Program Development of the Competitiveness of the Bulgarian Economy', as well as the ill-timed notification on the part of the Bulgarian Small and Medium Enterprises Promotion Agency (BSMEPA) about the methods of drawing up the financial reports, resulted in the declining number of submitted projects

in 2008 (123 projects participated, i.e. 26.8% fewer than in 2007). 30 projects dropped out due to administrative noncompliance while another 32 projects dropped out due to discrepancies between the team capacity and the eligibility of the project

idea. 61 projects scored more than 60 points (out of a 100) and were invited to sign contracts for financing by the Fund. Out of these 49 are in priority areas and are allocated as follows: • Information and Communication Technology (ICT) – 21 projects;

• Instrument-building – 4 projects; • Biotechnology, Pharmacy, Chemistry – 12 projects; • New materials and Nanotechnologies

– 6 projects; • Eco Technologies and Waste Treatment – 3 projects; • Energy-saving Technologies and Renewable Energy Sources – 3 projects; The approved subsidies for these projects amount to 12.3 million levs which is 58.6% less than the year

before. The average subsidy for one project is 201,600 levs, which is 23%

Bulgaria in the European Research Area

The accession of Bulgaria to the Framework Programs of the EC practically broke the existing implementation frame

of research programs and opened new opportunities to work on scientific projects. It increased access to modern scientific

equipment and transfer of knowledge, experience and intellectual potential. The framework programs ensure

the establishing of science as a basis for boosting competitiveness. They are used as a basic instrument for building the

European Research Area and are in essence a method of managing scientific research.

PROJECTS WITH BULGARIAN PARTICIPATION IN FP5 (NUMBER) more compared to 2007, and is mainly

due to the increased aid intensity supplements. The National Innovation Fund was pronounced by the European Commission

to be one of the forty "good practices" for 2006 as an example of the state administration's support for enterprises. In the European Commission's Small Business Act of June 2008, NIF is pointed out as a good practice to support SMEs' innovations

and is the only Bulgarian project mentioned. Bulgaria has gained experience with its participation in three framework

programs: the Fifth, Sixth and the currently, the Seventh.

Fifth Framework Program (FP5)

Bulgaria's profile in FP5 is characterized by the following:

• Participation in 254 funded projects with a €22-million contribution on the part of the EC; • Highest project activity under the

Sustainable Development Program, ICT, and Human Resources and Mobility Programs. A comparatively small number of projects have been submitted under horizontal programs like Innovations and International Activity; • Balanced participation by institutional

types. The Bulgarian Academy of Sciences has 90 financed projects, the higher education institutions have 80, and the private sector has 84 projects.

Sixth Framework Program (FP6)

FP6 aims to accomplish the tasks defined in Article 169 of the EC Treaty signed in Amsterdam. It presumes the strengthening of the scientifictechnological base of the Community economy and promotes modern scientific and technological research targeted at achieving competitive scientific products on the international market. Being the chief instrument of building a European research area, the program is characterized by the following features: • Concentrating the scientific efforts into a small number of strategic thematic fields;

BULGARIA'S PARTICIPATION IN FP6 BY PRIORITY AREA (NUMBER OF PROJECTS)

FINANCING UNDER FP6 BY PLANNING REGIONS Planning Region

Financing in percentage of the total: funding under FP6; North-Central Region 1.65; North-East Region 6.00; North-West Region 0.63; South-East Region 2.67; South-West Region 85.95; South Central Region 3.10; • Building a critical mass of research potential; • Simplifying the assessment procedure. The FP is built on three main blocks with specific measures:

Block One – the Community's strategically oriented research and its integration through activities in seven priority areas: genomics, information and communication technologies, nanotechnologies and nano-materials, sustainable economic growth,

aeronautics and space, food quality, civil society and governance. Block Two – Structuring the European research space through activities in the fields of innovations, mobility of the potential scientific personnel, unique scientific infrastructure, society

and science. Block Three – Strengthening the foundations of the European research area through coordination and supplementary activities in the area of scientific research under scientific programs (national and transnational) and complimentary measures. Universities and scientific units, SMEs, big companies, as well as non-profit organizations have access to the program. The activities involve not only research but also the dissemination of knowledge, analysis of the economic and social effectiveness following their implementation, including evaluation of the success factors. Bulgaria took part in 341 projects with 451 Bulgarian entrants in the Sixth Framework Program. €39,320,355 has been received in the form of research project funding (with membership fees of €17 million for the same period). The analysis of Bulgaria's participation

in FP6 outlines the following trends: • After officially joining the program, substantial growth in the Infrastructure, 4 Science and society, 2 Marie-Curie and mobility, 8 Science and innovation, 6 ICT, 21 Life sciences, 2 EURATOM, 4 Research for policy

support, 4 International cooperation, 8 SME, 7 Policies, 0 Sustainable development, 12 Citizens, 9 Foods, 4 NANO, 6 Aeronautics and space, 1 ERA-NET, 2 amount of attracted funds was observed through the years (the participation fee is fully reimbursed). • According to attracted financial resources, the distribution among the different institutions is comparatively

balanced according to types of participating institutions: Bulgarian Academy of Sciences – 156 entries (a little over

€15,000,000), universities – 123 projects (a little over €13,000,000), industries – 58 projects (approx. €6,000,000), other organizations (including the National Center for Agrarian Studies, non-governmental sector, state institutions, municipalities) – 114 projects (over €7,000,000). • Participation in the various thematic priorities is also balanced. The ICT field stands out as especially successful, with considerable quality potential, within which companies register the greatest number of successful

projects. University and scientific structures perform well in "Environment and Sustainable Growth" and "Food Quality and

Safety" thematic priorities. With respect to participation and the funding received under FP6, a severe imbalance is observed on a regional level. Nearly 86% of all FP6 projects with Bulgarian coordination or participation (€27 million financing) are

concentrated in the Southwest planning region.

Seventh Framework Program (FP7)

The EU Seventh Framework Program for research, technological development and demonstration activities promotes advanced scientific research in emerging areas of knowledge. This program is a means of promoting the involvement of science policy with the other Community policies such as employment, regional development, competitiveness and innovations in order to guarantee complementarity and synergy between them. The program is oriented toward building an integrated European research area and achieving lasting and sustainable economic growth, an objective realized within four specific sub-programs: • Cooperation – conducting scientific research in priority areas; • Ideas – research in new and/or emerging areas; • People – human resource development; • Capacities – building scientific potential in Europe. The results from Bulgaria's participation in the first call for proposals session and the subsequent schemes can be summed up as follows: • 950 participants from Bulgaria in

about 350 submitted projects; • Participation of Bulgarian organizations in 104 projects approved for financing worth over €16 million. The financed projects of the research organizations (of which 3 projects are for the Academy of Agriculture and 35 for the

Bulgarian Academy of Sciences) amount to €4.5 million in total.

EU Framework Program for Competitiveness and Innovation

This program is a new instrument of the EU for promoting innovations and entrepreneurship in order to encourage the competitiveness of European enterprises. The SMEs are the chief target group of the program. The program supports innovative activities, including eco-innovations, facilitates the access to funding and provides services in support of businesses in the European regions. The wider use of information and communication technologies is promoted, as well as the development of the information society. The activities also aim at increasing the use of renewable energy sources and energy efficiency. The FP consists of three programs: "Entrepreneurship and Innovations", "ICT Policy Support", and "Intelligent Energy – Europe II" (IEE-II), and its implementation period is 2007-2013. With the financial support of the EU Framework Program "Competitiveness and Innovations" operates the Enterprise Europe Network – Bulgaria, which is an integrated information-consulting network in support of businesses.

New Instruments of the Ministry of Economy and Energy

The Ministry of Economy and Energy (MEE) and the United Nations Devell opment Program (UNDP) announced a national program for promoting innovation activity of young people in Bulgaria known as the TECHNOSTART Project. Under this program, undergraduate students or those who graduated in 2008 aged up to 29 and having no registered firms in their name can apply for grants. On the basis of approved business plans, the young people receive grants of 20,000 levs with mandatory co-financing on the part of the entrepreneurs- to-be amounting to 10%. MEE also launched a support scheme for transferring knowledge to enterprises (voucher scheme) aiming at providing enterprises with technological knowledge from universities and scientific organizations ("knowledge providers") for the purpose of stimulating the science-business relationship.

Projects oriented towards solving problems of an applied nature by obtaining new knowledge, qualify for funding under this scheme. The scheme only finances the costs for consulting services rendered by the knowledge provider to the beneficiary enterprise. After closing the evaluation procedure for the applications, the initial list included 80 qualified applicants. The scheme's budget for 2008 was 1 million levs.

OP Competitiveness

Operational Program "Development of the Competitiveness of the Bulgarian Economy 2007-2013" is funded by the European Regional Development Fund (ERDF) and by the national budget. The amount of public funds available is €1.1 billion.42

The budget for the next four open procedures is directly oriented at improving the enterprises' technological base and increasing their innovative activity (introducing innovative products, processes and providing innovative services, meeting internationally recognized standards, technological The first contracts with beneficiaries under the open procedures worth a total of €66.5 million which were announced in October 2007, are for providing SMEs with grants under the following procedures:

• Technological modernization in the enterprises – 131 approved project proposals out of 306 submitted;

• Complying with internationally recognized standards – out of the 291 submitted project proposals 181 have been approved.

modernization in SMEs and large enterprises). It increased by 88,012,350 levs and has reached 272,838,283 levs.

The difficulties in ensuring the financing of work on the contracted projects (providing the necessary cofinancing, the non-eligibility of VAT expenses and the delays of grant payments during project implementation) forced the Managing Authority of OP Competitiveness, banks and leasing companies in the country to take a joint approach. The framework agreements signed with the banks aim to aid the implementation of the firms' investment projects by providing ad hoc investment credits at preferential interest rates and an accelerated funding approval procedure conforming to the requirements of OP Competitiveness. The banks have already opened special lines of credit conforming to the Framework agreement rules in response to the specific needs of innovative enterprises. These include the increased risk in financing innovative projects, slow returns on introducing a new product or start-ups, as well as a necessary co-financing of the

OP "Development of the Competitiveness of the Bulgarian Economy 2007-2013", http://www.eufunds.bg/,

http://www.opcompetitiveness.bg/bg/index.html In 2008, 23 commercial banks entered into an agreement to extend credits for projects financed under OP Competitiveness.

FUNDING ALLOCATION OF THE NATIONAL SCIENCE FUND BY TYPE OF ORGANIZATION (€)

The projects under operational programs are financed on the principle of reimbursement of approved expenses, there are no advance payments under the contracts, or if there are any, they are a small percentage of the total

project budget. OP ”Human Resources Development”, http://ef.mlsp.government.bg/bg/index.php, http://www.eufunds.bg/

46 Bulgarian Small and Medium-Sized Enterprises and Their Part in the Absorption of EU Structural Funds, analytical

report, July-August 2006. work on European programs and on the National Innovation Fund.43In spite of the measures taken, firms are still submitting few project proposals, which is the result of a lack of sufficient information and training

seminars about project preparation and implementation under EU Programs. The cumbersome procedure

for payment approvals also needs to be added to this list, as well as the delayed cash transfers to the recipients' bank accounts, which extremely impedes the activity of the smaller firms having no available spare resource to finance the initial phase of

the projects.

OP Human Resources Development

The European Social Fund (ESF) supports the development of human potential in Bulgaria through the ”Human

Resources Development” Operational Program45. After the first call under BG051PO001/07/3.3-02 ”Development

Support for PhD students, post-doctoral students, post-graduate students and young scientists” in

2007, 20 projects were approved. The second call for project proposals under Priority Field 3 included, ”Improving the Quality of Education in Accordance With the Labor Market Needs Toward Building a Knowledge- Based Economy”, a major area of intervention and ”Strengthening the Relations between Educational and Training Institutions, Research Sector and Businesses” by means of a grants scheme under BG051PO001- 3.3.04 ”Development Support for PhD students, post-doctoral students,

post-graduate students and young scientists.” This has now been completed.

Private Financing of Innovation. Public funds continue to be the main source of funding for research and innovation

in Bulgaria. Business' share of support for research and innovation projects is insignificant, which places Bulgaria at the bottom of EU memberstates ranking by the indicator.

Financing of Innovation. Projects by Businesses

The survey of the innovation activity of enterprises in Bulgaria conducted by the Applied Research and Communications

Foundation in the last quarter of 2008 encompassed 1,004 businesses, 428 of which (42.6%) answered the question about the main sources of financing the companies' innovation projects. The enterprises ranked the significance of the various sources of financing of innovation as follows:

1. Their own funds – 61.2% of the respondents rely on their own means to implement innovation projects, which could, to some

extent, be explained with the fact that company innovations (according to the answers of 248 businesses) are mostly developed

by their employees. 2. Bank loans – 29.2% of the respondents point to bank financing as the second major source.

As the bank products tailored to support businesses to operate with the instruments of the Structural Funds are relatively

new, the answers apparently refer to the traditional investment crediting by banks. 3. Financing from European programs

(3.7%) and specialized national funds (3.5%) appears as the third major source, although its share is insignificant

compared to the own funds and the bank loans (according to the respondent 428 businesses). These results to a great extent confirm the conclusions of a 2006 survey by Vitosha Research46 about the main sources of financing businesses' innovative activity. For the most part businesses continue to rely on company funds for innovation project funding, regardless of the increasing number of financial instruments in support of innovations and the increased amount of funds in 2008 made available through the two national funds, NIF and NSF, as well as OP ”Competitiveness”. Likely reasons are the lack of capacity

for preparing proposals and implementing projects, as well as lack of awareness of the possibilities offered by the EU programs, the National Operational Programs and the two national funds. Considering the lowtech profile of the Bulgarian economy

as a whole and the primary domestic market orientation of the businesses, it could be concluded that innovations

are not yet a strategic priority for the businesses. Other possible reasons for the firms' poor participation in the

European and national funds and programs are both the underdeveloped consulting services for project preparation

and implementation and the discouraging participation terms, e.g. the absence of a financial instrument for co-financing the Bulgarian participation in the EU Framework Program ”Competitiveness and Innovations”.

The application of the principle of reimbursement by the national operational programs, the delay in payment in the course of the project, and the large number of documents filed on applying, also creates challenges. Conclusions could be drawn similar to the

above concerning the holding companies and the companies joined in them from the interviews held with representatives of holding companies in the country: • Due to the world financial crisis the projects with innovative orientation have been 'frozen'.

Even applying for projects using the national funds and operational programs is not an attractive prospect for implementing

innovative projects in 2009. • The options offered through the operational programs, specifically OP Competitiveness, are

known comparatively well. The main problem appears to be the absence of capacity to work with the instruments of the Structural Funds – there are no specialized teams that can prepare and implement projects. • The opportunities provided by

the programs at the EU level (Framework Program for Competitiveness and Innovations, FP7 for Scientific Research and Technological development, etc.) are practically not known.

VENTURE CAPITAL THE BULGARIAN PRACTICE

"Advance Equity Holding AD" is one of the first Bulgarian company for equity financing analogous to the venture capital funds popular in the US and Western Europe. So far the company has invested in seven private companies in the following basic business areas: High Technologies (a System for Mobile Payments and Providing Internet services), Power Engineering (Renewable Energy Sources, Energy Efficiency and Compressed Natural Gas Deliveries), Farming (Cultivation of Agricultural Lands), Real Estate (Development of Industrial, Commercial and Logistic Areas). the introduction of modern technologies

in existing enterprises are venture capital/private equity funds. A large number of successful companies have sprung into existence thanks to the support of equity investment funds. No fewer are those that have significantly improved their cost effectiveness as a result of a new technology or rationalization applied by managing to attract an investor. The absence of high equity investment activity in Bulgaria is the result of several circumstances. First, there is the lack of fiscal incentives for the financial investors supporting innovative business start-ups. Because of their specific nature, the investments in new technologies, especially in newly set up companies, have a longer period of return and sometimes even fail. The opportunity for investors to use tax concessions, as well as receiving state guarantees for loans needed to finance innovative businesses are just part of the incentive instruments. Second, yet equally important, is the absence of special legislation regulating the creation of Bulgarian equity investment funds. It is needed to regulate matters of principle concerning the raising of capital in specialized

pools (Funds) with clear criteria for its investment and return after a certain period of time (10-12 years). Those investing their capital in similar funds would also normally enjoy tax relief for the period of their investment. Typical investors are the owners of a long-term resource. Among those are pension funds and insurance companies. In Bulgaria, the legislation regulating the operation of pension funds and the insurance companies does not allow investments in instruments which do not bring fixed profitability or are not traded on a regulated market. Currently, several foreign equity investment funds operate in Bulgaria.

However, they focus on existing local medium-sized and large enterprises offering potential opportunities for financing in exchange for a share of the ownership. There is no typical venture capital fund among these funds which could invest in emerging or inexperienced companies developing an innovative business. In a global financial crisis the interest of other equity

investors in the local market will certainly be limited, whereas the entrance of a venture capital fund into concrete projects in Bulgaria is not likely to happen. At the same time, Bulgarian pension funds constantly accumulate new resources when the

alternatives to their investment in financial instruments traded in the stock exchange or in bank deposits are far from attractive or profitable. Ensuring, through a series of legislative changes, the conditions for creating local companies specializing in equity

financing of innovative business projects and whose investment capital would be secured through clear regulations about the participation of Bulgarian institutional investors, seems a very real and completely justified alternative.

Human Capital for Innovation

Human capital for innovation includes the accumulated knowledge and skills to create, transfer and implement new technological solutions. It is expressed through the quantity and quality of the educational product and employment in some specific sectors such as research and development, entrepreneurship and high-tech and medium-tech sectors. Human capital for innovation

is related to the overall condition of the secondary and university education system which is supplemented by lifelong learning. Human capital determines the long-term capacity of the national innovation system but it is influenced by the current potentialities and restrictions which it creates. This makes it an important target of the national policy for innovation-based

economic growth. The crisis in the financial and real sector and the deepening worldwide recession has changed corporate plans towards restraining from expansion and has resulted in investment contractions. The sources of competitive advantages

sought are mainly a result of cutting production costs rather than of pursuing diversification. The need to survive has shortened the horizon of planning, and the pursuit of higher effectiveness has become a driving force when managing a firm's resources.

There is a deepening of the negative effects of population ageing and brain drain which is extremely important for the European countries, including Bulgaria. The expected changes are connected with the decrease in the number of newly-opened workplaces,

limitation of the funds for raising qualifications and developing professional skills and the change in the workforce ratio on the labor market.

Research Career, R&D and High-Tech Employment

The number and quality of those who successfully complete their PhD degree reflect the dynamics and ability of the national innovation system to generate new scientific and/or technological knowledge in the future. On the other hand, employment in R&D and high-tech sectors of the economy is an indicator of the current demand for human capital for innovation in the national innovation system. 450 levs with a premium of 1,000 levs when the PhD paper is defended within a year after submission. In 2007 and 2008, two calls were held under the Operational Program "Human Resources Development" grant scheme of "Support for the development of PhD students, post-PhD students, post-graduate students and young scientists" with a budget 3.912 million levs for the first year and 9.779 million levs for the second year respectively.

The financial stimulus is undoubtedly a necessary step for increasing the attractiveness of PhD study. In order to attract the attention of young researchers, however, including those who have received their higher education abroad, the Bulgarian universities have to offer diversified multidisciplinary programs, reflecting the modern trends of scientific and technological development, and at the same time to train specialists for the R&D business sector.There is not enough differentiation in Bulgaria regarding the positions held and the remuneration received between university graduate specialists and PhD specialists. According to the data from the INA-3 survey in 2008 only 2.8% of the companies surveyed have personnel with PhD degrees. The lack of proper motivation undermines the efforts of universities to make the tertiary stage of higher education more attractive. When carrying out its innovation policy, Bulgaria needs to support the efforts of the European countries oriented towards mobilization of the most Scientific-technological spheres of education in compliance with the International Standard Classification of Education (ISCED97) are: Natural Sciences (ISCED42); Physical Sciences (ISCED44); Mathematical Sciences and Statistics (ISCED46); Informatics (ISCED48); Technical and Engineering Sciences (ISCED52); Production and Processing Sciences; (ISCED54); Architecture and Construction (ISCED58). The human resources in science and technology are measured according to the definition given in the Canberra Manual and include both people who have successfully finished higher education in science and technology and people without higher education qualification, but doing jobs which require such qualification. prepared and qualified part of the workforce, with the highest contribution to creation and dissemination of technological knowledge – the PhD students in the scientific and technological spheres of education. The share of PhD students in the scientific- technological spheres of education in 2006 doubled compared to the level of 2000, and in this way Bulgaria managed to outstrip half of the new EU member states. The measures for increasing the attractiveness and quality of PhD study, supported by the government, make it possible for this trend to be preserved in the coming years. The international mobility of PhD students is an indicator of internationalization of both higher education and the research system of a given country.

It shows the degree of attractiveness of research programs offered and in certain cases opportunities for career growth of young researchers in the host country. During their education PhD students participate in research activities and thus contribute to the development of the research system. When they return they can apply their competences to solve certain research and business problems and become an important element of the international research network. The most attractive research programs and terms for doing research are offered in Switzerland and the United Kingdom where the share of foreign PhD students educated by local universities is 40%. They are followed by Canada, Belgium and the US where foreign PhD students range between 20% and 35%. In absolute figures the leading country is the US (79,000 foreign PhD students in 2001), followed by United Kingdom (35,000 PhD students in 2004).

EU-27 Bulgaria which allow it function effectively and competitively. Bulgaria's comparatively low figures in that indicator (0.56% of the workforce for 2006, followed only by Romania) are complemented by an insufficient growth rate of a mere 12% at a base level, too low compared to that of Europe. The people employed in the field of Research and Development – being a kind of innovation system input – directly influence application and patent activities. A survey within the European Union shows that despite the differentiation regarding the size and organisation of European economies, long-term trends show that large-scale investments in personnel employed in the field of science and technology lead to more significant results at the output end of the innovation system. This is manifested in newly created knowledge and know-how, including in the form of protectable intellectual property. Despite the complex nature of the processes studied54, the European countries with the highest innovation activity report patent activity results which significantly exceed the average index of 101.3 (Finland – 223.2; Sweden – 152.0; Switzerland – 395.0; Austria – 180.0; Luxembourg – 189.0; Denmark – 155.6). In Bulgaria, the opposite tendency is

observed. The 12.74% increase in the number of people employed in R&D between 2002 and 2006 is almost entirely accounted for by the rise in general employment (11.09% for the same period). In this context, the positive change amounts to a mere

1.49%. The personnel employed in the R&D field is heterogeneous and comprises categories that do not directly relate

to the research activity carried out; part of the newly created knowledge is deliberately not subject to patent

protection out of security considerations and in order to protect the areas of research interest. Share of the people employed in R&D in relation to general employment, as follows: Finland – 3.22; Sweden – 2.12;

Switzerland – 2.12; Austria – 1.98; Luxembourg– 2.59; Denmark – 2.44 with a EU-27 index of 1.45.

R&D PERSONNEL BY SECTORS, EU-27, 2006

Higher education, 43% Enterprises, 42% Non-commercial organizations, 2% State, 13%

the number of employed people in the field of R&D, in relation to employment in general, however, does not lead to a corresponding, even minor, increase in applicant activity. The applications for invention protection in the Bulgarian Patent Office

(BPO) filed by Bulgarian applicants in 2007 are only two-thirds of the number of the patent applications in 2002. Of course, the emergence of an invention is the result of research activity that does not automatically stem from hiring highly qualified personnel. Besides, a patent-acquisition procedure takes time. In this case, however, the reasons behind such a disparity should be sought elsewhere. The analysis of the institutional structure of those employed in R&D provides an explanation for the peculiarities of the Bulgarian innovation system presented here. In the European countries, the R&D workforce is predominantly employed in private businesses and higher education sectors. This means that they are, to a greater degree, exposed to

the influence of the market and are therefore geared towards production and quick return of the money invested in research.

In Bulgaria nearly 60% of the personnel engaged in carrying out scientific and research activities is in the state sector – funded by the budget and complying with primarily institutional financing principles and centrally oriented priorities of scientific and

technological development. With a relative share of 12.4% of R&D employment in the business sector inrelation to employment in general in 2005 (with only Latvia having a lower share of 9.6%), the companies in Bulgaria constitute 55.4% of the patent applications in the European Patent Office (EPO). Bulgaria has the highest relative share of R&D specialists in the state sector: 58.4% (according to the latest statistical data State, 57% Higher education, 26% Enterprises, 16% Non-commercial organizations, 1% for 2006), a long way ahead of the next member state – Cyprus, with a 29.3% share. A further challenge for the national innovation system and its human resources potential is the so-called 'fifth freedom' of the European Research

Area, which aims at creating an environment for the free movement of researchers between the member states. Regarding the state of the research equipment in the country and the financial resources allocated to R&D, Bulgaria can hardly compete

with the developed economies. This is why the policy of attracting human resources in the field of science and technology needs to be more focused and comprehensive so as to prevent further brain drain.

R&D PERSONNEL BY SECTORS, BULGARIA, 2006

Sectors: Business, State, Higher education, Private, nonprofit organizations, Other.

There is a worldwide growth trend in employment in the field of science and technology in comparison to general employment in the countries studied (average annual rate of 2.5% for USA and 3.3% for EU-15)57. As far as staff employed in R&D is concerned, researchers have a higher growth rate than the rest of the categories. In Bulgaria, the provision of research and high-tech business with the necessary human resources (number of employed in relation to structure) is still a challenge for the educational system and scientific and innovation policy. Within this framework, there should be a place for adequate supporting

mechanisms. Bulgaria's participation in European programs for researchers' mobility provides opportunities for overcoming

the imbalance in the provision and effective use of human resources for technological and innovative development. Active partnership in the exchange of scientists and researchers, however, requires attractive offers for PhD degree programs and a

career in scientific fields of priority. A practice which is gaining popularity in European countries consists of giving grants on a competitive basis for doing research that is expected to have a considerable impact on the national economy. The fields envisaged are: nanotechnologies, molecular biology, and renewable energy resources in which Bulgarian scientists have

strong international positions. Factors that contributed to growth were the adoption of a number of regulations and quality standards. For example, the software and the consultant services for business process modeling concerning the preparation

of documentation and/or the implementation and maintenance of the ISO standards were considerably cheaper than the classical type of consultants from the mid-90s. The requirements of the companies from electricity, telecommunications, and

water supply sectors were also a serious incentive for the implementation of business process management facilitated

by SPICT.

SMALL NICHE COMPANIES – AN ALTERNATIVE TO THE BIG NATIONAL CHAMPIONS

Chaos Group has a world-class competitive platform level for 3D visualizations and animation and registered patents used by almost all game manufacturers. The company has attracted a small group of freelancers and companies working with its products and exporting services with high added value in the field of architectural design. Other examples include Telerik Plc.

(which develops programming environments and creates Microsoft oriented technologies), Sirma Group and its joint venture partner Ontotext (which work in the field of semantic technologies). Both firms are among the key sponsors of some of the world's biggest conferences and expos in their respective field. These firms also have a significant number of people who deal with R&D. Sirma has been named by the Ministry of Education as the most successful Bulgarian firm participating in the research programs of the European Union. A number of other companies have also succeeded in joining the world chains for adding value as direct suppliers of leading technological companies or as manufacturers of their own equipment which is exported to

some markets which are traditional for Bulgaria (for example Daisy Technology Ltd. and Datecs Ltd).

By the wider use of the off-the-shelf ERP packages, the business processes are standardized and codified. This, however, can threaten the judgment and creativity of employees. In many cases the innovation takes place before and during the ERP implementation while after that the system sustains its equilibrium state. One of the most significant effects of the application of an overall ERP is not only the potential transformation of the model and chain of adding value in the enterprise but also

the outsourcing of groups of processes which cannot happen without the ERP systems. The overall process of management consulting, connected to the business process modeling, reengineering and development of the capacity of the customer organization to manage its business which is based on the process method, can continue for 20 – 30 months. The results include a decrease in the period for producing or delivering the service through an optimization of the delays, improvement of quality

through more effective control and often – organizational and structural changes which comply with the actual business processes. The leading sectors which have introduced the greatest number of ERP systems are industrial mechanical engineering, food processing industry, and chemical industry while the sectors which are lagging behind are tourism and

construction and real estate. At the same time due to strong competition for end-customers, exactly these three sectors have invested substantially to improve their online presence over the last three years. Customers participate and are the most important partner during the whole innovation process (they derive data from the overall performance; test prototypes and beta versions; establish products in the market, etc.). Customers (or rather, some specific segments like the early adopters) stimulate innovations. Learning from customers, managing the knowledge about them, and the overall relationship between them and the enterprise establish key competences for achieving higher competitiveness and innovativeness. The customer relationship

management (CRM) systems appeared as a strategic response from the companies to this challenge. The implemented systems vary significantly according to their scope, functionality and complexity: from simply well organized systems for management

of contacts to systems which are fully integrated with the other functions of the ERP systems and which automatically

offer to their clients services like the recommendations of amazon.com for buying books based on client history. Regardless of the complexity of the application, all specialists in the field of CRM say that this is not software but a goal-oriented strategy of an organization. These goals, therefore, result in particular requirements to the design of business processes which eventually

can be met by software. Eight percent of the companies (twice more than those with ERP systems) have introduced CRM systems. The growth of implementation processes is connected to the growth of outsourcing of CRM activities in multinational

companies in Bulgaria after 2000, the development of telemarketing, and the gradual development of capacity in Bulgarian adopters, including the development of open code systems. The open code systems manage to overcome a number of

drawbacks of the ERP systems (for example, the company's necessity to adjust business processes to what the systems offer rather than to adjust IT system to its specific needs). For the second time in a roll since 2006 it has been empirically proven that the enterprises which use open source systems, too, are more innovative than those which use only Microsoft. Each layer of the pyramid has a volume which corresponds to the percentage of companies (shown on its left) with a certain number of functionalities. At the moment the leader in this field is OC Bulgaria, which holds the rights for the majority of tests used in

business. The demand for this type of service is created by enterprises that are involved in very intensive training activities, for example the pharmaceutical industry. The government turned out to be another serious client. The managers, looking for

optimization of expenses for compulsory trainings turn to e-learning providers and realize considerable economic benefits – not only of money but of the time of their employees. This market is also closely connected to the market for electronic tests for the needs of human resources management departments. These tests not only save time and money but also create possibilities for more complex agreements and cooperation between companies. It will not be long before corporate training,

team building and personnel recruitment are done (at least partially) in 3D environments. In each sector there are specific information technologies which directly increase the effectiveness of certain functions or the overall productivity of enterprises (CAD/CAM in textiles, GIS/GPS in transport and logistics). These specific information technologies are also a prerequisite for the

inclusion of Bulgarian companies in the global production chains which facilitate the innovation process (modeling, virtual testing, quick prototype preparation) by reducing the product cycle (many times) and decreasing the marginal price of the next implementation or they are just a condition for the provision of particular product (billing systems). In other cases the benefits of the SPICT depend on the degree of automation and digitalization of production. The price and time for the implementation

of a system for document circulation depend on whether the whole communication is already electronic, and it only has to be input automatically in the system, or the whole documentation history has to be digitalized, the habits of many

Methodological Notes, Sources of Information and Definitions

Innovation.bg comprises five groups of indicators which describe the national innovation system and its functioning:

1. Gross innovation product.

2. Entrepreneurship and innovation networks.

3. Investments and financing of innovation.

4. Human capital for innovation.

5. Information and communication technologies.

Each group contains several synthetic indicators. Working definitions which could differ from stricter theoretical definitions have been applied to the groups and the indicators. The latter consist of various numbers of statistical values displayed graphically. They are grouped in way providing the most comprehensive view of the respective component of the national innovation system. The graphs representing the values are based on the internationally recognized definitions and concepts. The report uses innovation in its many forms and meanings. Innovation is the adoption of a new or significantly improved idea, product, service, process or practice in order to meet a certain need. The concept is also used in a narrower sense in some parts of the report.

Methodology of the survey of the innovation activity of enterprises in Bulgaria

The Agency and its team have 20 years of experience in conducting qualitative and quantitative surveys in the fields of technology, innovation, labor market, gray economy and corruption for clients including the European Commission, the World Bank, the World Economic Forum (Davos), UNDP and other international institutions, as well as marketing research for a wide range of Bulgarian and foreign companies.

The data base is populated from various public sources – legal reference services (Ciela and Daxy), Large Taxpayers (NRA), Yellow Pages, etc, as well enterprises operating on regulated markets (for which the various authorities maintain lists of enterprises), enterprises which have participated in samples, validations, and quota substitutions in various surveys for other clients for the period 1998-2008, and the enterprise data base of the Innovation Relay Centre of the Applied Research and Communications Fund.

The Applied Research and Communications Fund has been carrying out regular surveys of the innovation activity of enterprises in Bulgaria (INA) since 2004 based on the methodology of the Innovation Survey of the European Community. The sampling, fieldwork and its quality control has been performed by the marketing agency Vitosha Research. The third survey of the innovation activity of enterprises (INA-3) was carried out in the period November 3 – December 18, 2008. The planned sample included 1,000 enterprises (200 micro, 600 SMEs and 200 large ones) in sectors 10 to 74 of the National Classification of Economic Activities (NCEA) – 2003. The respondent target group were the owners and senior managers of the enterprises.

The general population on which the sample is based includes the corporate data base of Vitosha Research of about 260,000 legal persons which have been statistically active in the period 2000-2006.96 Two random samples of 2,000 micro enterprises and 6,000 SMEs were generated on this basis. The entire population of large enterprises (673) was included. Fifty-five regional quotas (based on the relative number of enterprises in each region and, within the regions, on the enterprises in the regional center and outside it) were calculated on the basis of these three sub-populations. A preliminary validation of the contact information for the enterprises in the sample was carried out for each region. Companies having obsolete addresses were discarded and the fieldwork was carried out in the order of the provided lists until the entire planned number and quota for the type of town had been covered. Where available lists were exhausted without conducting the planned interviews the sample was supplemented by enterprises by quota (identified by the interviewers) provided they met the criteria for selection. Overall, a quarter was substituted, mostly micro enterprises and small companies. A total of 1,028 questionnaires have been received but 14 of them have been discarded following a telephone check of 10% of the planned sample (a total of 100 questionnaires selected from all regions on the basis of a simple random sample) because the interview had not been carried out or had been conducted improperly (conducted with an inappropriate respondent). The logical review corrected entry errors in 5 questionnaires and 10 cases were discarded mostly for not meeting the type of activity criteria. The number of interviewers was 128, who visited 3,738 addresses in a total of 4,152 visits due to second visits made necessary by absent respondents or a subsequent interview meeting required.

COMPONENTS OF THE INNOVATION INDEX OF BULGARIAN ENTERPRISES

1. Product innovations

1.1. The enterprise has started to make products new to the company

1.2. The enterprise has started to make products new to the Bulgarian market

1.3. The enterprise has started to make products new to the international market

2. Process innovations

2.1. The enterprise has adopted production methods/processes new to the company

2.2. The enterprise has adopted production methods/processes new to the sector

3. Organizational innovations

3.1. The enterprise has adopted new or considerably improved management methods and systems

3.2. The enterprise has made considerable changes in the organization of work

3.3. The enterprise has established new or considerably changed relations with other companies in the value adding chain

4. Marketing innovations

4.1. The enterprise has made considerable changes in the design or the packaging of its products

4.2. The enterprise has applied new or considerably changed methods for the sale and distribution of its products and/or services

Overall number 1004

Distribution by type of ownership of controlling stake Innovation Index of Bulgarian Enterprises

The index summarizes the measurement of the innovation activity at the company level and aggregates seven types of innovation of the four types applied by enterprises (to products, processes, organization and marketing) and their degree of novelty (to the enterprise, to the market or to the world) as registered by INA-3. Its values range from 0 to 100, with 0 indicating that the enterprise had lacked innovation, while 100 meaning that the enterprise had made all types of innovations at the highest degree of novelty. The process and organizational innovations are in turn equally weighted within the sub-group. Process innovations in INA-3 refer mostly to technologically new or improved processes. Organizational innovations usually involve purely process innovations without any technological renewal (such as the application of process and organizational reengineering). For this reason they are considered together. The index considers three types of innovations, which are equal from the point

of view of the positioning of the innovation – product innovations (what is being produced), process and organizational (how it is being produced)97 and marketing (who it is designed for and how it is sold). The various components of the index have equal weights within their groups. Availability of data, information sources and definitions *Innovation.bg* contains secondary statistical and administrative data and data from nationally representative surveys of enterprises conducted by the sociological and marketing agency Vitosha Research. The report uses a number of freely accessible Bulgarian and foreign sources, which in some cases has resulted in differences in time horizons, definitions of the used variables and graphically represented indicators. This appendix summarizes notes, definitions and methodological explanations to the separate chapters. The Applied Research and Communications Fund updates annually the *Innovation.bg* report aiming at making it a reliable and effective instrument for monitoring the Bulgarian national innovation system.

1. Gross Innovation Product

1.1. Innovation product Every three years the European Commission and Eurostat conduct the Community Innovation Survey (CIS). In 2003, for the first time a pilot CIS compliant survey was carried out by the National Statistical Institute (NSI) of Bulgaria. The latest, fourth CIS covered the period 2004-2006 and was published in 2008. It has been complemented by the results from a special nationally representative survey commissioned by the Applied Research and Communications Fund and conducted by the sociological and marketing agency Vitosha Research in 2008. The agency has adopted and slightly adjusted the CIS methodology, in order to provide both maximum comparability of the data to the ones of Eurostat and NSI. Data from the International Organization for Standardization (ISO) have also been used in the report. *Eurostat and NSI data are accessible on the internet at:* http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_ 33076576&_dad=portal&_schema=PORTAL. Manufacturing is defined to include NACE's sections C to E while services comprise NACE subdivision 51, sections I and J, subdivisions 72 and 73 and groups

74.2 and 74.3.

Innovative enterprises are enterprises which introduce on the market new or considerably improved innovation goods (products and services) and innovation processes, including new methods for providing services and channels for the supply of products. Innovation products and processes have to be new for the enterprises themselves, but not necessarily for the market. Product innovation is a product or service which is new or considerably improved when it comes to its main features, technical specifications, purpose, incorporated software or other intangible components. Process innovation is the adoption of a new or considerably improved production technology, new or considerably improved method for providing services or supplying products.

The high technology sectors of industry include the manufacturing of pharmaceutical products and preparations (NACE 24.4); office machinery and computers (30); radio, television and communication equipment and apparatus (32); aircraft

and spacecraft and their engines (35.3). Medium high technology sectors of industry include the manufacturing of chemicals products (except for pharmaceutical products and preparations) (24); machinery, equipment and domestic appliances (29); electrical machinery and apparatus not elsewhere classified (31); medical, precision and optical instruments (33); motor vehicles, trailers and semi-trailers (34); railway and tramway locomotives and rolling stock (35.2); motorcycles and bicycles (35.4); other transport equipment not elsewhere classified (35.5). Research-intensive high technology services are: post and telecommunications (NACE 64); computer and related activities (72); research and development (73). Research-intensive market services are: water transport (61); supporting and auxiliary transport activities and activities of travel agencies (62); real

estate activities (70); renting of machinery and equipment without operator and of personal and household goods (71); other business activities (74). Research- intensive financial services are: financial intermediation (65); insurance and pension funding (66); activities auxiliary to financial intermediation (67).

Other research-intensive services are: education (80); health and social work (85); recreational, cultural and sporting activities (92). 1.2. Technological product The data in this section are taken from the European Patent Office (http:// www.european-patent-office.org/index.en.php), the U.S. Patent and Trademark Office (http://www.uspto.gov/) and the Bulgarian Patent Office (http:// www.bpo.bg/bg/). Because of the numerous changes to the European patent legislation and the more complicated information service of the European Patent Office, the available primary administrative data on submitted patent applications and registered patents cannot be used.

1.3. Research product The report has used data from the data bases of the information platform Thomson Reuters – ISI Web of knowledge (which includes the data bases Web of Science, Derwent Innovations IndexSM, Biological Abstracts®,

MEDLINE®, Journal Citation Reports®) and the information platform ELSEVIER (including the following data bases: Science Direct, SCOPUS, Engineering Village, EMBASE.com).

2. Entrepreneurship and Innovation Networks

2.1. Entrepreneurship There is no systematically developed methodology and data on entrepreneurship in the Bulgarian economy. The Bulgarian SMEs Promotion Agency (BSMEPA) is the main source of information on the current state and development perspectives of entrepreneurship and start-ups. The report uses data from the National Statistical Institute and comparative entrepreneurship data from the European Bank for Reconstruction and Development (EBRD). The annual reports of BSMEPA are available at: http://www.sme.government.bg/IANMSP

2.2. Innovation networks Innovation networks in Bulgaria were studied based on data from sociological surveys: for the EU – Community Innovation Survey 2004-2006, published in 2008; for Bulgaria – INA-3. The CIS methodology has been adapted and slightly adjusted in order to provide maximum comparability with the EU data, which are available at: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=EU_TB_science_technology_innovation&depth=2 (theme Science and Technology).

3. Innovation Investment and Financing

Sources of the data for R&D Investment are NSI and Eurostat. The data areavailable on the website of Eurostat, theme Science andTechnology:http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=EU_ TB_science_technology_innovation&depth=2112 R&D expenditure includes current expenditure on R&D and expenditure on the acquisition of tangible fixed assets intended for R&D use made by domestic and foreign enterprises in Bulgaria. R&D expenditure is made by various economic agents, classified in four sectors: (a) The business enterprise sector includes all companies and organizations whose core activity is the production of market goods and services (excluding those included in the higher education sector); (b) The government sector includes public organizations and institutions which offer, rather than sell, services which meet the individual and collective needs of society and are primarily financed through the state budget (excluding the entities of the higher education sector); (c) The higher education sector includes universities, colleges, higher education institutions, research institutes within higher education institutions and university hospitals; (d) The private non-profit sector includes private foundations, associations, societies, etc, providing non-profit services. R&D expenditure by sources of funding represent financial transfers between the enterprises and the organizations classified under the above mentioned sectors, as well as through resources, provided from abroad. In this regard, there are five sources of R&D funding: (a) enterprises' revenues; (b) the state budget (excluding those of the higher education organizations and the university hospitals); (c) the higher education organizations and university hospitals' budgets; (d) non-profit organizations' resources (foundations and associations); (e) foreign entities. R&D expenditure by type of costs is divided into: (a) current R&D costs, which include the costs of materials, external services, personnel and other operating costs. Depreciation costs are not included; (b) costs on tangible fixed assets acquisitions intended for R&D, including the costs for purchasing land, construction costs and purchase costs of buildings, costs of building overhauls and costs of machinery and equipment acquisition. R&D expenditure by type of research includes: (a) expenditure on fundamental research, which comprises experimental or theoretical research whose main purpose is to acquire new knowledge on the essence of phenomena and observed facts. Usually, fundamental research results do

not have commercial applications and are intended for publication in science magazines or for exchanging among interested persons and organizations; (b) expenditure on applied research, which comprises original research carried out with the purpose of acquiring new knowledge which is, however, primarily directed towards achieving certain practical aims and tasks; (c) expenditure on experimental development, which comprises systemic explorations, based on available knowledge, derived from science and/or practical experience. The purpose of experimental

development is to create new materials, products, and devices; to implement new methods, systems, and services or to improve considerably the already existing ones.

X CONCLUSIONS

Human Capital for Innovation and Creativity

Scientific career and R&D

Data from NSI and Eurostat have been used. The Eurostat data is available on its website, under the theme Science and Technology:http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=EU_TB_science_technology_innovation&depth=2

R&D personnel includes employees directly involved with R&D, as well as employees (managers, administrators, clerks) who provide direct support to R&D in the country as measured by physical entities or by the equivalent of full employment.

Employees who are only indirectly related to R&D, such as guards, doorkeepers, canteen personnel, accountants, cashiers, etc, are not counted. R&D personnel by sectors of performance follows the same pattern of division as R&D expenditure by sectors of performance, according to the type of enterprise and organization in which the personnel carry out the R&D activities

(see the definitions on the range of the economic sectors under the R&D expenditure indicator in this appendix). R&D personnel comprises three main categories – research, technical and support staff. Researchers are professional experts directly engaged in R&D and working on the definition and development of new knowledge, products, processes, methods and systems, as well on the management of the corresponding topics (projects). Technical staff includes the persons with the necessary knowledge and experience in one or several fields of science and performing research and technical tasks by applying operational principles and methods under the guidance and control of researchers. Support staff includes skilled and unskilled workers, accountants, personnel experts, and secretarial support staff who participate in the implementation of research projects or are directly associated with them. Research and development includes creative work carried out systematically in order to enhance the volume of knowledge, including about humans, culture and society, as well as using this volume of knowledge for new applications. R&D consists of fundamental and applied research and experiments.

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