



MIRIAD

Managing and Infusing Research Investment and Development

South-East Bulgaria R&D Investment Strategy



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1. Introduction

This document presents the key findings and the relevant strategic recommendations have been made as part of the South and East Bulgaria side of EU project “Managing and Infusing Research Investment and Development” (MIRIAD). MIRIAD (www.miriad.org) is a two-year project funded by the Framework 6 Programme of the European Commission under the Regions of Knowledge 2 initiatives.

The key *aim* of MIRIAD is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe - *Yorkshire and the Humber* in the UK, the *Western Turkish region* from Istanbul (inclusive) to the Greece and Bulgarian borders of Turkey, *East Macedonia and Thrace* (including Thessaloniki) in Greece, and the *South East Bulgarian region* from Sofia (inclusive) to the border with Greece and Turkey, including also the Bulgarian Black Sea region. The choice of regions represents an opportunity to build upon inter-regional cooperation and linkages that already exist between the regions and the proposed project partners.

In the past, knowledge and R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption. However, it is clear that successful strategy building must take account of both simultaneously. The aim of MIRIAD is to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with knowledge and R&D transfer, absorption, and investment. In essence, knowledge and R&D investment is a function of a region’s ability to transfer, spillover and absorb knowledge. MIRIAD focuses on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced knowledge and R&D investment.

The key objectives of the project are:

- To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education
- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments tailored to the regions in which they are operationalised
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices for enhancing regional R&D investment.
- Facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers, methodologies and models for the creation and development of research oriented businesses.
- Establish and launch an R&D Investment Strategy for each of the regions that are complementary to the existing policy initiatives and activities already being undertaken, but also have a real and positive impact on future R&D investment performance. The processes underlying the development of these strategies can then be applied in other regions across Europe.

The key analytical components of the project, addressed to achieve the main objectives of the project, include the following:

- To examine the current and potential knowledge capability of SMEs and the scope for improving their competitiveness through the development of knowledge transfer and business alliances strategies within supply chains and across industries and markets.
- To understand the current role played by SMEs in each region and some of the barriers and opportunities for their expansion.
- To draw out the specific knowledge deficits and/or surpluses within SMEs.
- To identify and understand the likely intermediaries and institutions (particularly universities) required to be involved in establishing knowledge transfer platforms.
- To understand the processes best suited to stimulating engagement from SMEs in each region.

The main activities undertaken in each of the four MIRIAD regions can be summarized as follows:

- Scoping and Analysis of R&D Performance.
- Foresight and Scenario Workshops.
- Benchmarking Regional Knowledge Demand and Absorption.
- Benchmarking Regional Knowledge Supply and Transfer.
- Regional Policy Roundtables.
- Trans-National Regional Learning Platform.
- Regional R&D Investment Strategies.

This document represents the contents of the R&D Investment Strategy established for the South and East Bulgaria region. The material gathers together the strategic recommendations formulated by the Bulgaria MIRIAD project team set within the context of the key findings reached during the given above activities by working packages.

How MIRIAD project defines the Bulgarian region?

The South and East Bulgaria region, as defined by the MIRIAD project documentation, includes four out of the six planning regions in Bulgaria – South-West region, South-Central region, South-East region, and North-East region. Thus the so formed MIRIAD South and East Bulgaria region covers approximately 74.2% of Bulgarian territory, homes 79% of the population, producing about 83.3% of the country's GDP. The MIRIAD methodology is quite clear and understandable as the other Balkan participating countries are Turkey and Greece

and the idea is to cover all cross border regions in order to run comparative studies and to find out the possible ways of collaboration. But the so established South and East Bulgaria region, covering the South Bulgaria and the Black Sea region of Bulgaria according to the given above weight of different indices does not provide any possibility for inter country comparisons. The given above peculiarities lead to some information and statistical distortions. For instance, some of the statistical data concerning R&D are available only on the country's level without any possibility for regional decomposition, while some other of the indicators reversely exists only on a level of a planning region not allowing aggregation to the MIRIAD defined region. This is the main reason why in the following text of the strategy some of the data will be given on a national level and some other only by the each of the four official planning regions forming the MIRIAD Bulgarian region.

2. Competitiveness

As shown by Table 1, Bulgaria as a whole and each one of the four studied planning regions lags far behind the EU average one. Bulgarian GDP per capita in PPS is almost 2.7 and 2.8 times lower than the EU-27 and the EU-25 ones correspondingly. At the same time, rather high inter-regional disparities are observed. The leading position belongs to South-West region, where GDP per inhabitant in PPS is 1.48 times higher than the Bulgarian average. On the opposite position is South-Central region with GDP per inhabitant 5509.3 PPS, compared with 7133.9 PPS for Bulgarian economy.

Table 1. Key Competitiveness Indicators

Indicator	Bulgaria	SWR	SCR	SER	NER	EU-25
Summary Innovation Index, (2006)	22.0	n.a	n.a	n.a	n.a	50.0
Gross Domestic Product						
- (PPS) per inhabitant, (2004)	7133.9	10549.9	5509.3	6420.1	6299	22414.7
- (PPS) per capita, EU-27=100 (2006)	37.1	n.a	n.a	n.a	n.a	103.9
- (millions BGL*), (2005)	42 797	17 313	8 752	3 728	5 846	n.a
Labor Productivity per person employed						
- EU27=100, (2006)	35.3	n.a	n.a	n.a	n.a	103.9
- BGL, (2006)	10825	14250	9106	10475	9359	n.a
Unemployment Rate (2006, %)	9.0	6.5	7.6	9.8	12.6	7.9
Economic Activity Rate (2006)	64.5	69.5	61.7	63.4	63.9	70.6
Mean Gross Monthly Earnings (BGL, 2006)	355	421	309	331	329	n.a

Notes: * BGL in current prices

SWR - South West Region, SCR - South Central Region, SER - South East Region, NER - North East Region.

Source: National Statistical Institute, Eurostat, European Innovation Scoreboard (2006)

Bulgarian labor productivity per person employed is also relatively low. It reaches 35.3% of the EU-27 level in 2006. In regional terms the South-West and the South-East regions report the highest levels, while the South-Central region - the lowest level of labour productivity.

But the observations show that the labour productivity (except the South-West region) does not vary considerably by planning regions.

According to official statistical data, the Bulgarian average nominal gross monthly earnings are many times lower than those in the EU. This fact and the observed wage dynamics cannot be interpreted as a sufficient condition for the low unit labour costs and thus for the competitiveness improvement. The combination between the low salaries and the relatively low labor productivity is not a good starting point for raising competitiveness.

The regional disparities among the average salaries are much smaller than the disparities in the regional GDP per inhabitant. What concerns the average salaries by districts within a given region, a clear trend similar to GDP dynamics occurs. The relatively higher increase of annual earnings are observed in the main cities of the regions – capital of Sofia in South-West region, Bourgas in South-East region, Varna in North-East region, and Stara Zagora in South-Central region.

The unemployment rate in Bulgaria is also relatively higher than the average in the EU member countries (in 2006, it was 9% compared to 7.9% in EU-25). At the same time unemployment is lower compared to some of the new member states as Poland and Slovakia. Since 2001 the rate of unemployment has been gradually decreasing, but with different dynamics across planning regions. Due to the capital of Sofia, the best results are obtained in South-West region, where the unemployment rate is even less than that of EU average. On the second place is South-Central region with unemployment rate of 7.6%, whereas on the last place one may find the North-East region with an unemployment rate of 12.6%.

The economic activity rates also differ considerably among planning regions. The highest rate is observed in South-West region (69.5%) whereas its value for the South-East region reaches only 61.7%.

The key stakeholders in relation to improving the competitiveness of the MIRIAD Bulgarian region are: the Bulgarian government, the districts' administrations, the Regional Development Councils, the Bulgarian Association of Regional Development Agencies (BARDA) and the Regional Development Agencies.

3. Innovation and R&D

The clear R&D investment gap is observed between the Bulgarian regions in comparison with the EU average. South-West region, including Sofia, confirms its leadership position in terms of R&D expenditure, as the largest share of R&D expenditure in the country (almost 84%) is observed there (see Table 2). North-East region ranks second place with 5% of the total R&D expenditures. Statistical data obviously display the main characteristic of the Bulgarian innovation system – the high centralisation and concentration of resources and activities in the capital of the country.

Table 2. Regional R&D and Innovation Performance in Bulgaria in 2005

Region	R&D expenditure by regions (%)	Share of R&D in local GDP (%)	Value added per employee (BGL)
North-West	2.2	0.2	9089
North Central	1.6	0.07	8939
North-East	5.0	0.18	9359
South-West	83.9	1.01	14250
South Central	4.8	0.12	9106
South-East	2.5	0.14	10475
National level	100.0	0.49	10825.0

Notes: The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

Although in Bulgaria R&D expenditure and personell data are collected by surveys that follow guidelines and definitions outlined in the Frascati Manual and the Regional Manual of Eurostat, data on the 20 SII indicators are not completely available, especially at regional level. The collection of regional data still faces major methodological difficulties that impedes the comparability among regions and also provides distorted picture of regional R&D.

Recommendation 1	Rationale
To provide more reliable statistical base for in-depth analysis of innovativeness of specific sectors as a necessary condition for the innovation policies conducting.	Currently Bulgaria is taking part in the European Innovation Survey but only with a number of indicators, mainly those related to <i>transmission and application of knowledge</i> , but the data for <i>innovation finance, output and market</i> are not provided.

The SWOT summary of Bulgarian R&D investment is presented in Table 3. It further highlights the potential to fully exploit the R&D capabilities and commercialisation potential of the region's higher education and research institutions' sector. The potential problem in relation to regional intervention is the dependency on national institutions and decision-making authorities as the main source of funding for higher education and research in the country.

The key stakeholders involved in policies relating to R&D investment are: the Bulgarian National Government, the District Innovation Commissions, the Regional Innovation Commission, and the Regional Development Council. District Innovation Commissions are in process of establishment. They are formed as private-public partnerships and will be responsible for the implementation of concrete innovation projects for the districts as well as for identifying and developing new project proposals at district level.

Table 3. R&D Investment SWOT Summary

Strengths	i) R&D units located in the region are in the fields identified as priority sectors for economic development; ii) Significant research potential and good qualifications of the staff .
Weaknesses	i) The innovation activities of researchers are limited to the development stage only; ii) A clear lack of R&D investment by the business sector, which is largely dominated by SMEs; iii) Insufficient funding of R&D activities and lack of enough training of R&D staff.
Opportunities	i) Participation of the institutions from the region in the European and global initiatives and access to European programs such as ISPA, SAPARD, PHARE, Sixth and Seventh Framework Programme; ii) Macroeconomic stabilization and sustainable economic growth; iii) New forms of economic co-operation (for example regional clusters).
Threats	i) Emigration of high quality R&D staff; ii) Insufficient level of innovation culture among national and regional administration; iii) Lack of co-ordination among institutions and policies on R&D.

It is important to stress that during the round table discussions, all the consultations and interviews undertaken in the regions, there was a strong and permanent finding that usually innovation is considered in the narrow sense – solely as an R&D-based one. This finding has posed the problem about the scarce innovation culture of SMEs.

Recommendation 2	Rationale
To create an innovation culture of a broader understanding beyond the R&D framework.	Three different types of innovation and technology management competencies have to be considered: - <i>technological competence</i> : the ability to chose, adopt and manage specific technologies that are the most relevant to SMEs' needs; - <i>entrepreneurial competence</i> : the ability to generate and implement innovation strategies that are indispensable part of the overall business strategy of the given SME; - <i>learning ability</i> : the ability to adapt the firm organization and personnel culture to the conditions necessary for accommodating technological changes and innovations.

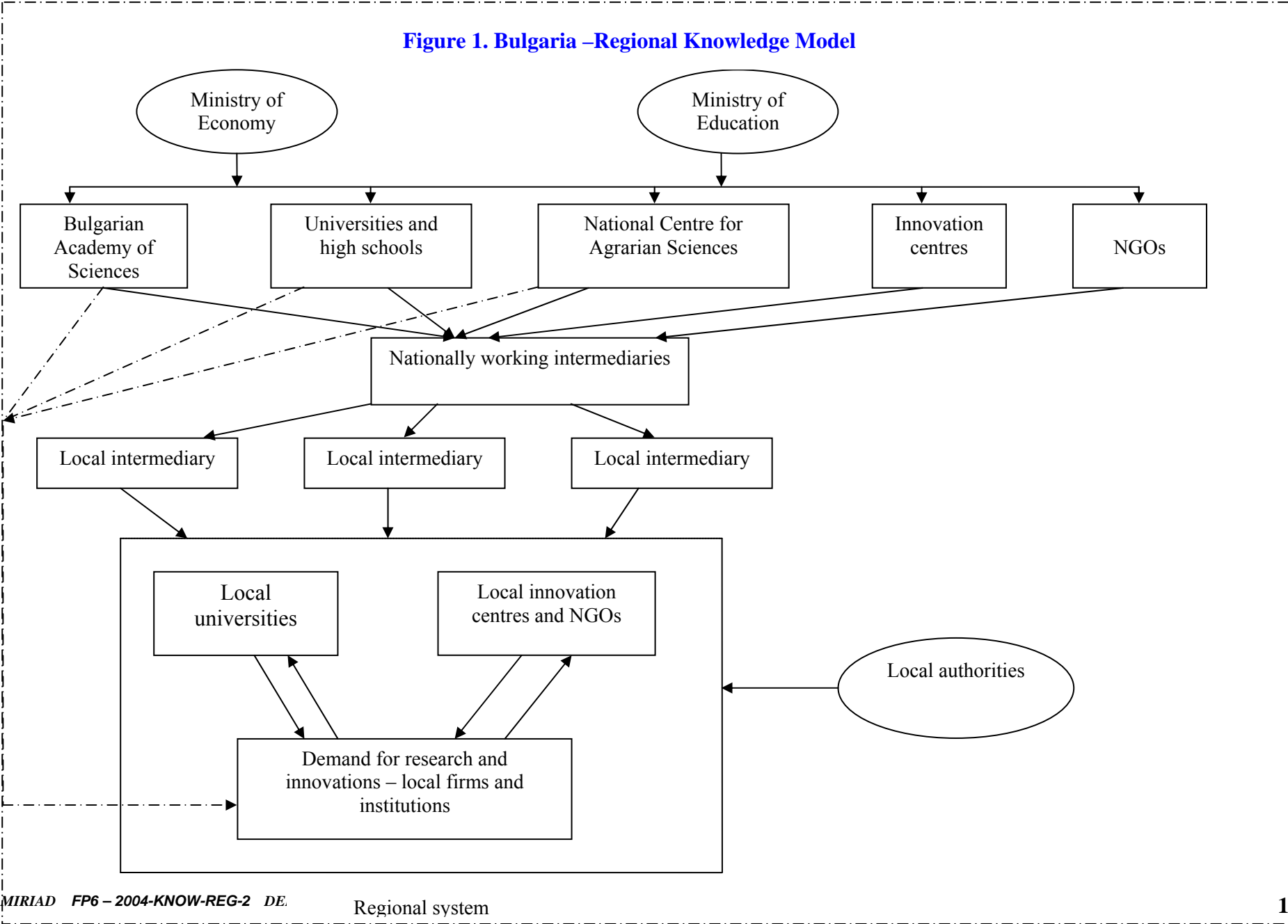
A broad conceptualization of knowledge creation, demand, transfer and flow based on the evidence collected to date is presented in Figure 1. In summary, it highlights the following:

- Currently Bulgaria has a two-tier knowledge and innovation system - old state research institutes and universities on the one hand and numerous newly established

private universities, non-governmental institutions and firms on the other. The two tiers fail to synergize on scarce public and private resources in the country.

- The old innovation infrastructure has not been reformed to address new and emerging needs of the economy and has remained primarily government financed without private support. Companies and newly emerging innovation structures on the other hand respond to international competitive pressure and trends and have established parallel innovation efforts, which usually are isolated and small scale.
- Traditionally the knowledge creation and transfer system in Bulgaria has been highly centralized with the dominant role of the state in governing the process. This model resembles the characteristics of the “Triple Helix I” (Etzkowitz, 1998) and has been observed in other former socialist economies as well.
- During the transition period through reducing the role of the state the national research and innovation system has shifted from Socialist type of a Triple Helix model to a “laissez-faire” type of model. The model has also to be described as non-linear one that takes both interactive and recursive terms into account.
- Universities have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firm.
- Demand for research and innovations by private firms were described as rudimentary and scarce.
- Unrecognized importance of innovations for sustainable development among SMEs managers is as important factor explaining low demand as the lack of financial resources.
- Traditional forms of academic-industry relations still prevail. They include rendering personal or team consultations and services to the firms and participation in liaison programs.
- The more intensive and formal institutional ties between universities and firms are still missing.
- Real estate development and formation of spin-off firms are still in embryonic phase. Some isolated and separate initiatives related to the extension of university research into development took place mainly confined to the establishment of applied research centres, NGOs and private firms by academics.

Figure 1. Bulgaria –Regional Knowledge Model



R&D investment policies impacting on the Bulgarian MIRIAD region are double pronged. First, there is a national innovation policy based on a National Innovation Strategy created in 2004 (see Table 4). The next step towards increasing the role of regional initiative in research and innovations in Bulgaria is to join the EU network of innovating regions in Europe and developing Regional Innovation Strategies for each of the six planning regions in the country (for the objectives of RIS see Table 4). The pilot initiative for Bulgaria to analyze and map the regional innovation system of South-Central Region (that is one of the 4 planning regions covered by the current project) was undertaken in 2001. The RIS project had been developed from 2001 to 2004, and the RIS was planned for 2004-2009 period. To achieve the main objectives of RIS 30 practical measures were proposed. In the first annual innovation plan 12 pilot projects were included.

Table 4. Summary of Key R&D Investment Policies

Policy	Objectives
National Innovation Strategy (2004)	The essential objectives of the innovation policy are: i) improving the competitive position of companies through innovation; ii) increasing the focus and upgrade the quality of the science and technology sector; iii) strengthening the link science - education - economy – society; iv) keeping young/good scientists and engineers in Bulgaria.
National Strategy for Science, Research and Development (2005)	The main goals are: i) to strengthen the competitiveness of Bulgaria's industry through science, technology and innovation; ii) to strengthen the science and technology sector through co-operation and concentration and intensifying the relationship with industry; iii) to provide a favourable climate for keep Bulgarian graduates in science and technology in Bulgaria.
Regional Innovation Strategy	The RIS identifies three major strategic priorities: to improve the competitiveness of the regional SMEs through innovation; to enhance innovation culture in the region; to develop further and to optimize the RIS.

Recommendation 3	Rationale
To establish a better and more efficient coordination between the National Innovation Strategy and RIS.	The institutional relations among the different regional authorities and the national bodies engaged in the process should be put in the appropriate legal framework .

4. R&D Investment Scenarios

This part presents three possible scenarios for the future R&D and knowledge creation and transfer developments in South-East Bulgaria. In addition it provides some comments about the influence these specific developments may have on the local economy. The three scenarios include:

- a “base case” whereby the region follows the current trends in GDP and R&D activities;
- a moderate optimistic scenarios, whereby the region goes on with slightly higher trends
- an optimistic scenario, where the region experiences a large improvement of the current developments.

Scenario 1 – Continuing the current trend

This scenario is based on R&D levels and GDP in South-East Bulgaria continuing at the current levels of annual growth between 1998 and 2003. We calculated the average growth in real terms first deflating GDP and R&D expenditure¹. It turned out that during the period 1998-2003 real R&D expenditures in South-East Bulgaria declined by 4.4% per annum while real GDP increased by 4.8%. The scenario obtained assuming that both trends will remain in the next 10 years appears to be very pessimistic. R&D as a percentage of GDP in real terms in South-East Bulgaria will decrease from 0.5% to 0.17% of GDP over the next 10 years². Dynamics of the R&D expenditure as share of GDP for the period 2004-2014 is illustrated by Figure 2. Following this scenario the level of R&D expenditure as share of GDP in Bulgaria will result in further lagging far behind the EU-25 average and the Lisbon target of 3% till 2010. Such developments will clearly have disastrous effect on the regional competitiveness.

The wider implications of the scenario are:

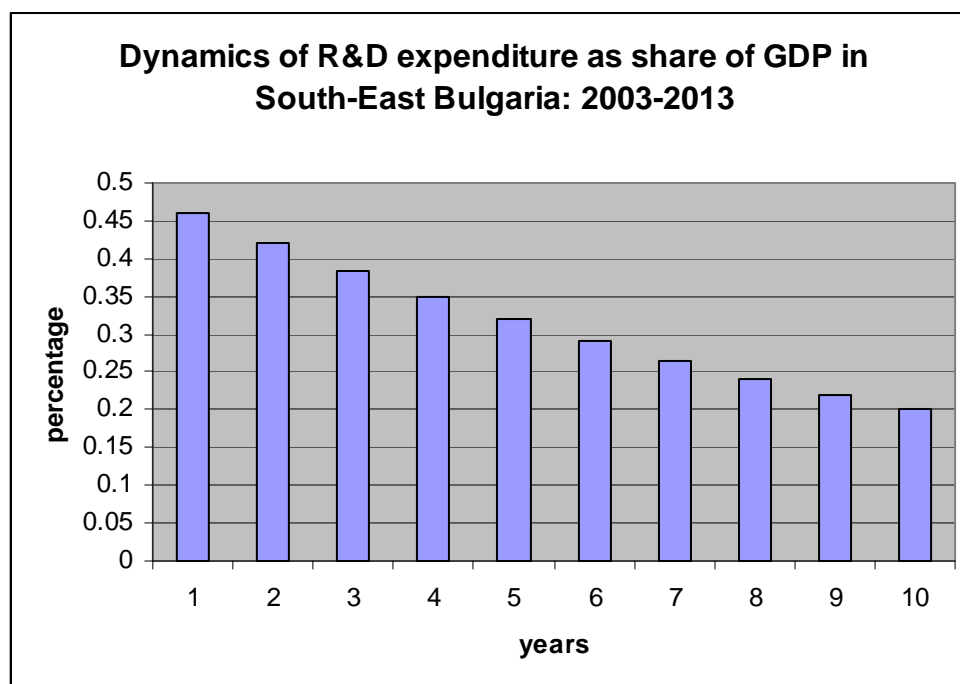
- South-East Bulgaria will find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, and low technology industries. As a result, there will be further restrictions on the growth of long-term economic potential of the region and on the future improvement of population living standards.
- Increased divergence from the more prosperous core regions of Europe and continuation of the economic decline initiated by the close-down of large enterprises – off-springs of socialism during transition to a market economy.
- The lack of incentives for SMEs to invest in ICT technologies and adopting new technologies;

¹ We use a common deflator for all 6 planning regions since currently regional deflators are not calculated by official statistics in Bulgaria.

² The forecasts based on nominal variables were also computed. In this case the share of R&D expenditure in GDP would decline from 0.5% in 2003 to 0.3% in 2013.

- The deterioration of the currently highly-qualified research staff and further restriction of innovation activities within the bounds of development stage without clear connections with the real business.

Figure 2: Scenario 1 – Continuing the current trend

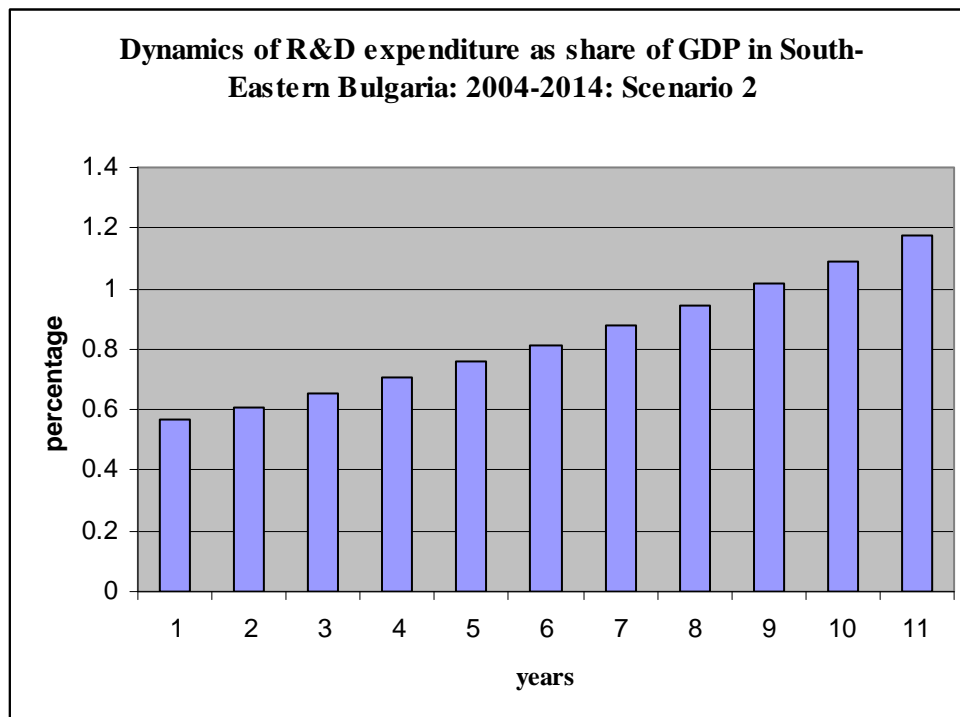


- The lack of opportunity for highly skilled jobs in high technology sectors and lack of perspective for career development in state-owned scientific institutes and universities will result in further brain-drain of the region and country as a whole.
- The lack of skills and dominance of low technology sectors would deter potential FDI, especially from new technology high added value sectors which demand highly skilled labor, as well as a supply chain to provide the necessary inputs.
- Insufficient R&D funding may mismatch the activities and interrelations between key R&D actors and may hamper the new forms of economic co-operation (for example regional clusters);
- Continuing the current trends would not ensure the remarkable improvement of innovation culture among national and regional administration and would not get over the lack of co-ordination among institutions and policies on R&D;
- Retaining the more intensive development for South West sub-region (that is currently in line with the most of the EU-countries) will result in further increase in the intra-regional disparities. The scenario implies that the capital will continue attracting highly-qualified labour force from the other regions and thus, the concentration of R&D resources will increase.

Scenario 2 – high increase in R&D expenditure (based on targets set out by National Innovation Strategy)

This scenario is based on the targets set out in the National Innovation Strategy: 2003-2013. The forecast of R&D expenditure in the Strategy refers to the nominal values of the variables. According to it till 2013 the share of R&D expenditure in GDP should reach 1.15% based on the assumption of 6% growth per annum of nominal GDP. Assuming the same scenario for the MIRIAD Bulgarian region, the nominal R&D expenditure have to increase by 14% on average annually in order to reach the target set by National Innovation Strategy. Figure 3 shows dynamics of the R&D expenditure as share of GDP for the period 2004-2014 following the scenario set out by National Innovation Strategy. Following scenario 2 would lead to an improvement in the relative position of the region with expenditure on R&D rising to 1.15% of GDP till 2014. This scenario can be considered as positive one that requires a substantial annual increase in R&D investment.

Figure 3: Scenario 2 – based on targets set out by National Innovation Strategy



The wider implications of this scenario are:

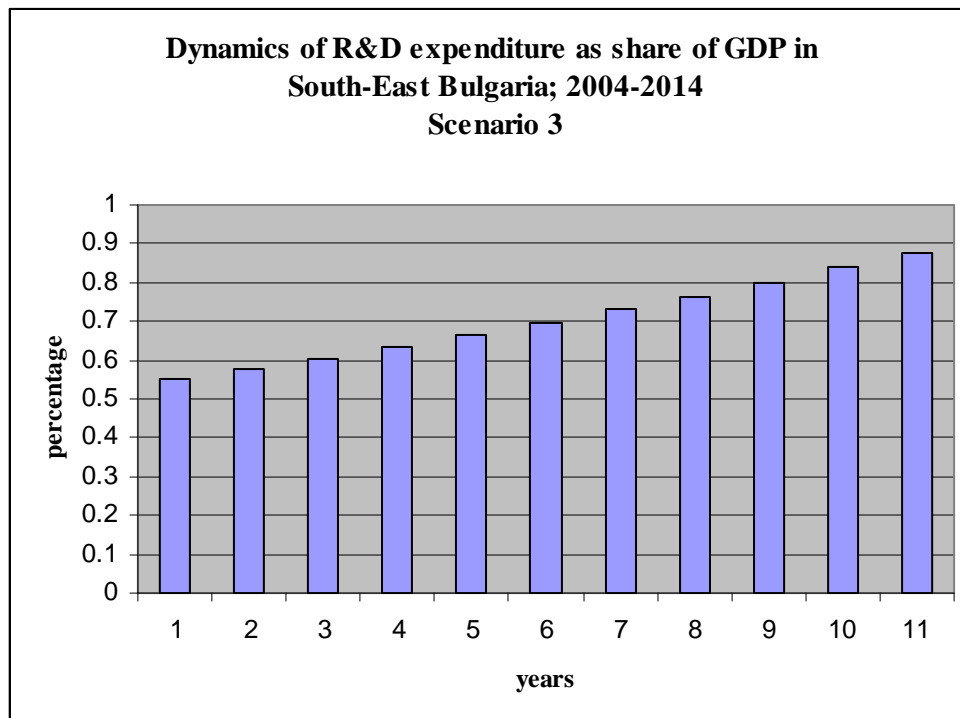
- South-Eastern Bulgaria will be a more competitive region in an increasingly globalising economy and under higher competition that it will face after Bulgarian accession to EU in 2007;
- The increased level of R&D will create a higher number of skilled jobs which will act as an incentive for skilled workers to stay in the region as well as attracting others from the outside, preventing the region from sinking into a low skill equilibrium.

- Attraction of FDI from high added value firms further boosting the regional economy.

Scenario 3 – moderate increase in R&D expenditure

This scenario is based on a moderate rate of growth of nominal R&D expenditure compared to the previous version - to 10% per annum. It assumes also a slightly lower annual growth in nominal GDP equal to 5%. Figure 4 shows that this would lead to an improvement in the relative position of the region with expenditure on R&D rising to 0.9% of GDP in 2014. However, this improvement is very slight and is still far behind the EU-25 level of 1.92% in 2003. Under this scenario it would still take a considerably long time period to converge with the EU, even assuming no increase in the proportion of EU average GDP spent on R&D.

Figure 4: Scenario 3 – moderate increase in R&D expenditure



The wider implications of the third scenario for four planning regions are as follows:

- The start of the transition to a modern knowledge based economy would be observed. This may enable South-East Bulgaria to start catching up with EU in terms of spending on R&D and innovations;
- While there is only a low level of growth observed this scenario stops the decline and offers a base to build on for the future.

- Arresting the decline may prevent the higher skilled jobs from leaving the region, ensuring there is demand for skilled workers and ending the brain-drain from the country.
- Pressure is eased on the state-owned scientific institutions and universities to extend their connections with business and to make the research more-market and practically oriented;
- There is greater scope for the cluster strategy to succeed as the higher levels of R&D allow greater amounts of innovation to be undertaken and a higher level of knowledge spill-over to occur.

5. The Knowledge Economy

As the South and East Bulgaria region covers the 2/3 of the most economically developed part of Bulgaria, almost all of the reasonable key stakeholders are situated there, and especially concentrated in the capital of the country – Sofia – South-West region. The universities in the capital and the Bulgarian Academy of Science institutes (all of them operating in Sofia) are the key drivers and the spine of knowledge creation. There are a very few of their affiliates or small higher education schools operating outside of the region with very small regional impact.

Knowledge creators located in the region are in the fields identified as priority sectors for economic development. They have significant research potential and good qualifications of the staff. The available problems occur include: (i) innovation activities of researchers are limited to the development stage only; (ii) lack of investments in research infrastructure; (iii) insufficient funding of R&D activities and lack of enough training of R&D staff; (iv) highly centralized old system that does not correspond to the needs of business sectors.

Recommendation 4	Rationale
Changing legal framework towards commercialization of knowledge and research activities at the universities and the other research centers.	The ability and willingness of the region's higher education sector to prioritize its business relations, and to create much closer relations with the business structures.
Recommendation 5	Rationale
Participation of the institutions from the region in the European and global initiatives and access to European programs such as ISPA, SAPARD, PHARE, 6 & 7 Framework Programmes, etc.	The delay in the implementation of national and regional innovation strategies may be overcome by creating the appropriate structures providing guaranteed access to different EU funds.

Knowledge demand and absorption is necessarily a difficult area of analysis and measurement. At a regional level, the best available indicators relate to industrial structure and the human capital capacity of the existing workforce. Industrial structure analysed in terms of the knowledge intensity of the region's businesses is a useful indicator of the potential demand for knowledge, while human capital capacity indicators are able to monitor the likely ability to absorb appropriate knowledge. The proportion of businesses within the South and East Bulgaria varies considerably. The share of persons with tertiary education ranges from 16.5% in South Central region to 31.1% in South West region. In the South-Central region the share of employed in medium and high-tech manufacturing is 1.8 times higher compared to the South-East and South-West regions. Regarding the employment in high-tech services, the leading position occupies again the South West region, whereas the rest planning regions are lagging far behind.

Knowledge demand and absorption is largely lies with the strategies pursued by the region's business community. This community is represented at the regional (and national) level by a number of 'umbrella' institutions, the most important of which are the Chambers of Commerce, various branch associations, regional development agencies and business incubators.

At both national and regional level, the policies relating to knowledge demand and absorption tend to be an implicit feature of other policies targeted at the private sector, rather than explicit policies in themselves. The national R&D policies include the instruments used by the Government to narrow the difference between the benefits to the economy as a whole and to each company of R&D, and thus to spread risks. The regional innovation strategy policies aim to improve knowledge and skills of SMEs, to develop and to implement innovations developing co-operation among enterprises, and to promote technology transfers.

Recommendation 6	Rationale
To consolidate the quantity and quality of the knowledge demanded by the regional SMEs on a larger base and thus to increase the competitiveness among them.	A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness.

There is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within South and East Bulgaria (as shown by Table 5). A large number of private non-profit organizations that help in knowledge transfer and absorption have been operating at both national and regional level. Among all regional development agencies, commercial chambers, regional and branch associations, technology transfer centers, business innovation centers, business incubators and other organizations supporting SMEs have been the most active in the field of knowledge transfer. Our impression from the interviews was that the intermediary organizations have no clear idea and understanding about their role in transfer of knowledge and innovations to the enterprise sector.

Table 5. Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
Bulgarian Association of Regional Development Agency (BARDA)	Acts as an umbrella association of independent regional and local economic development agencies and SME support centers. It includes 21 agencies and business centers, situated in all 28 districts of Bulgaria.
Chamber of Commerce	Facilitates, promotes, and represents the interests of its members, and contributes to the development of international economic cooperation. It consists of 23 independent and autonomous registered regional chambers, and of 88 sectoral organizations, incorporates over 20 000 economic agents on the territory of the country
Bulgarian Industrial Association (BIA)	It is a voluntary, non-governmental economic union of branch, regional and other associations, state private and cooperative companies; research organizations; institutes; banks; etc. It is a union of collective and individual members, including 28 regional associations representing the interests of the members of the regions; 49 branch chambers acting on behalf of the branch industries;
Association of SMEs	Facilitates, promotes, and represents the interests of its members – the small and medium size enterprises. The main goal of the Association is to strengthen the SMEs' business and to achieve international standards and the modern business practices. (The organization process of the Association is now ongoing)

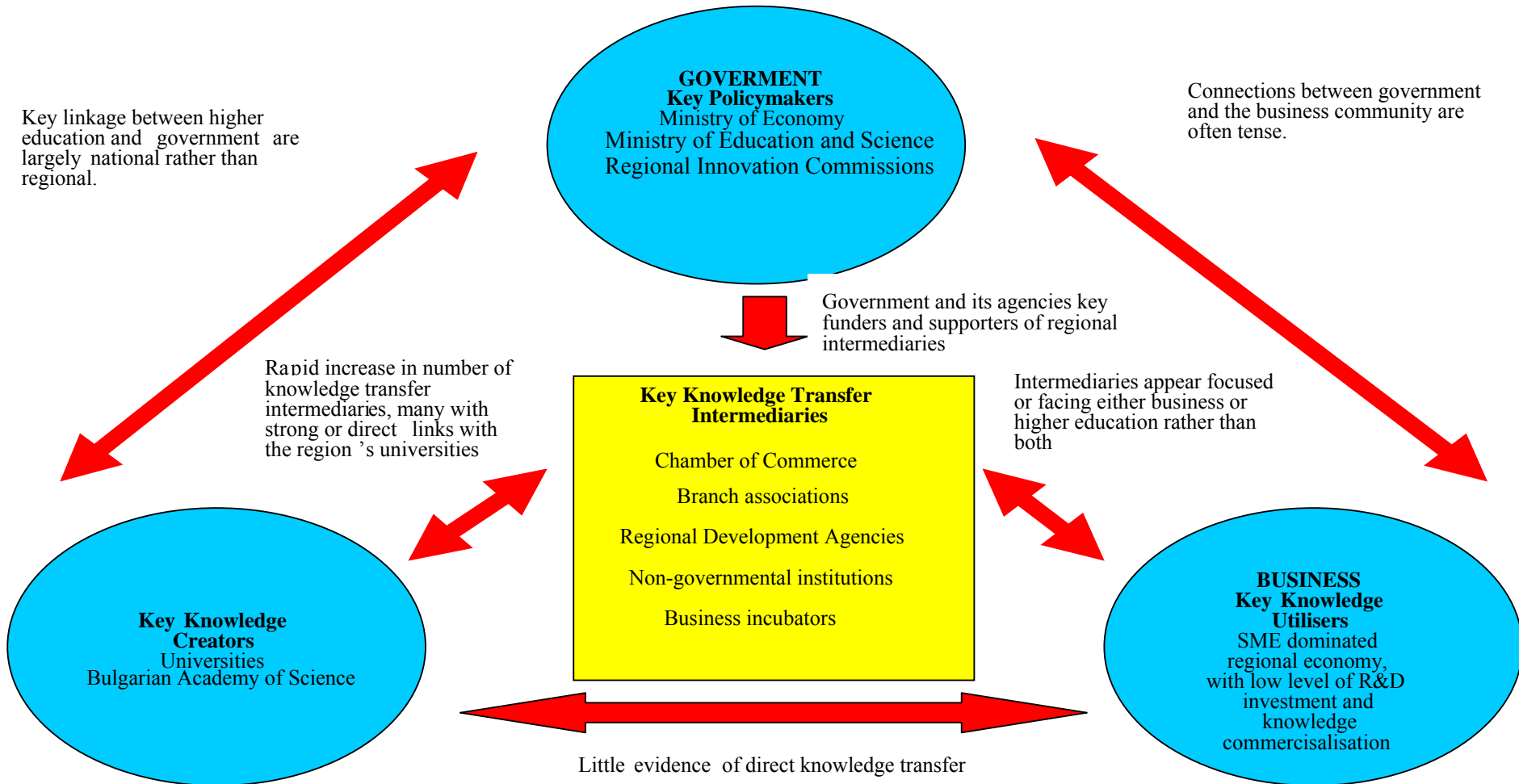
Figure 5 presents the representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. From this conceptualisation the following is apparent within South and East Bulgaria. A summary of the key issues of the knowledge economy development in the Bulgarian MIRIAD region are listed below:

- **Government** – key policymakers are the Ministry of Economy, Agency for Support of SMEs, Ministry of Education and Science and at regional level – Regional Innovation Commissions and Regional Development Councils
- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Knowledge producers (Universities and Higher Education and Bulgarian Academy of Science)** – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions.
- **Government-Knowledge Creators Interface** - key linkages between higher education and government are largely national rather than regional. The linkages primarily involve the National Science Fund for Bulgaria.

- **Knowledge Creators - Business Interaction** – little evidence of direct knowledge transfer. Intermediaries act as key facilitators of this interaction, with government and its agencies being a key source of funds and supporters of regional intermediaries. In general, there has been a rapid increase in number of knowledge transfer intermediaries, many with strong or direct links with the region’s universities. Many intermediaries appear focused or facing either business or knowledge producers rather than both.
- **Government-Business Interaction** - connections between government and the business community are often tense.

Recommendation 7	Rationale
To create new bodies and improve the existing ones of business support infrastructure, thus avoiding the informal contacts between the SMEs and the knowledge creators and reducing the excessive bureaucracy.	There are some national institutions, but it is a time to hurry up with the creation of regional ones and especially with the university structures for advising and consulting the SMEs.

Figure 5. Knowledge Flow within the Framework of the Triple Helix Model



6. SMEs Competitiveness, Innovation and Knowledge Networks

Analysis of SMEs competitiveness, innovation and knowledge networks draws on the information gathered through a range of interactions with innovative SMEs including interviews and consultations with 50 innovative SMEs³ from a range of sectors in the region and a focus group with 8 managers of non-innovative SMEs.

The interaction with SMEs was aimed at:

- understanding the barriers SMEs face in identification of the research and knowledge they require and finding out the particular types of knowledge that SMEs consider themselves to be deficient;
- understanding how (if at all) SMEs transfer and make use of knowledge generated by other SMEs and research actors and identifying the processes best suited to knowledge infusion into SMEs.
- gaining information about the issues facing the SME community in the area of knowledge transfer and in particular in the absorbing effectively the research and knowledge they know already exists.

Knowledge Stock and Competitiveness

Surveys results suggest that the most important factors for the competitiveness of the firms are the firms' human resources, followed by the firms' external relations, practices and routines within the firms, intellectual assets and physical assets. In terms of Human Resources, it has become clear that the loyalty of both employees and managers is the most important factor affecting competitiveness. The interviewed entrepreneurs value more the quality characteristics of managers than those of the employees. They rate both the formal and tacit knowledge of managers as being of high importance for firm's competitiveness. In contrary as regards to employees their formal qualifications are much less valued than the skills and competences they have accumulated during their work life. It has to be noted here that the competence needs vary among different sectors and firms, especially concerning innovative activities. Therefore the finding stemming from the data indicate that formal knowledge is less valued than tacit one should not be automatically transferred to all kinds of enterprises. For example whereas some sectors and firms require substantial formal R&D competence others may place greater emphasis on the development of prototypes, testing and trial production, and experience a greater need for skilled workers. Type of competences needed depends also on the type of innovations carried out – radical or incremental. The limited size of the sample does not allow carrying out analysis by economic sectors.

The summarized data about the role the firms' intellectual assets have played in relation to competitiveness show that market knowledge and IT facilities are rated as the most important. Interestingly, typical intellectual assets such as patents, copyrights, trademarks and trade secrets rank lowest in terms of importance. Some explanation of this finding can be found in

³ Having in mind the relatively low innovative activity of Bulgarian SMEs compared to the average EU-level, we decided to select for the standardised interviews instead of applying simple random sampling approach. According to the data from the National Innovation Survey conducted by National Statistical Institute about 16% of all firms operating in the country have innovated in the last three years.

the sector composition of the sample. Such assets seem to be more important for production firms than for service and trade ones. Since only one third of the respondents operate in the production sector, it is not a surprise that typical intellectual assets are not considered of higher importance to firm's competitiveness than the other assets.

Physical resources are generally the least important factors for the competitiveness of SMEs, and the most important among them is plant equipment owned by the firms, followed by industrial buildings are the most important physical resources.

Recommendation 8	Rationale
Encouraging SMEs to use typical intellectual assets such as patents, copyrights, and trademarks.	The necessary precondition is to provide adequate, efficient and high-quality protection of intellectual property by improved legal framework for enforcement of intellectual property rights.

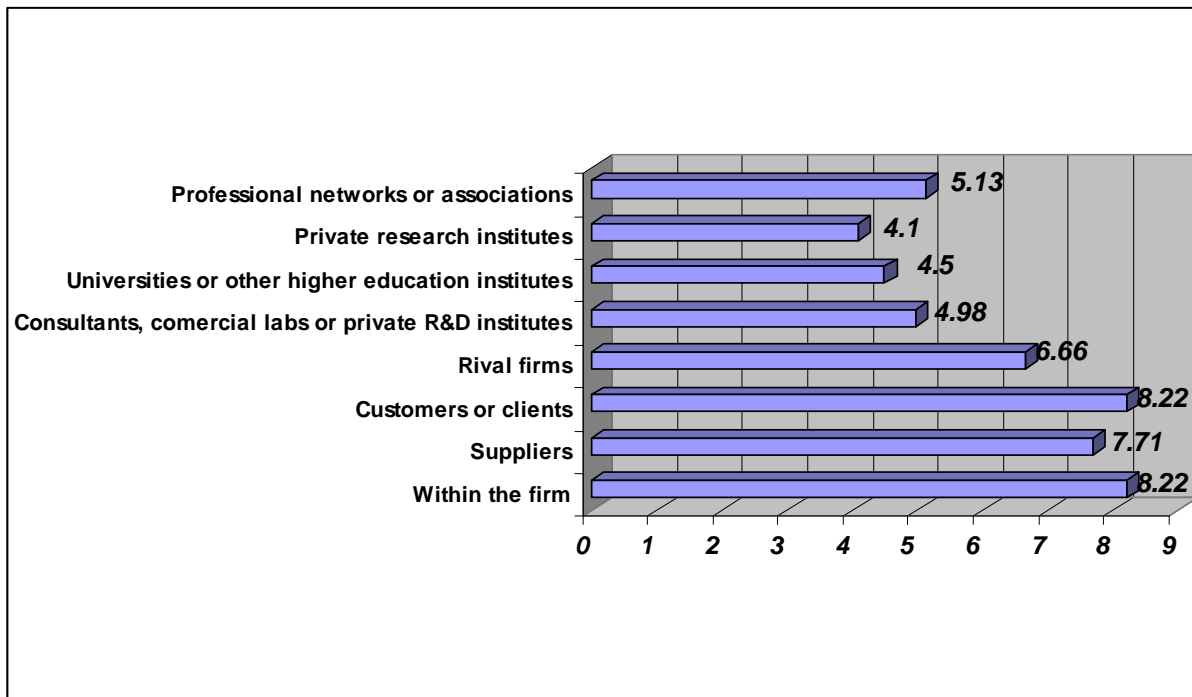
A general pattern of most of the human resources, intellectual assets, practice and routines, and external relations as major sources of SMEs competitiveness, is that they are considered to be of more importance than effectiveness. This means that firms are not utilizing the resources they possess as efficiently as they should to be competitive. The above finding raises the issue about the necessity to accept the R@D and innovation activities in the context of overall competitiveness.

Recommendation 9	Rationale
Supporting SMEs to expand and to increase their competitiveness in general and to improve the innovation capacity in particular.	It is assumed that the more effective usage of the current resources will act as a driving force towards increasing the R&D investments and thus to improve the long-run competitiveness.

Knowledge Creation and Acquisition

The analysis shows that the largest share of knowledge and innovations is created inside the SMEs, and only about one tenth of the innovations is taken from external sources. SMEs are more active in collaboration only with regard to process innovations. This finding is not a surprise because such type of knowledge creation and innovations include new or considerably improved production methods, methods for supply and supplementary activities. All of them require more active co-operation with external organizations than the product innovations. The main part of innovation in SMEs is not based on specific research activities but on the use of existing technologies.

One of the most striking finding stemming from the interviews is the low importance of traditional knowledge creators such as universities and private research institutes (see Figure 6). It became clear that the top two external sources of knowledge for SMEs are customers and suppliers. According to the survey data technological transfer of traditional type does not take place in the country. The results also indicate very weak relationship between SMEs and intermediary organizations such as professional networks and associations.

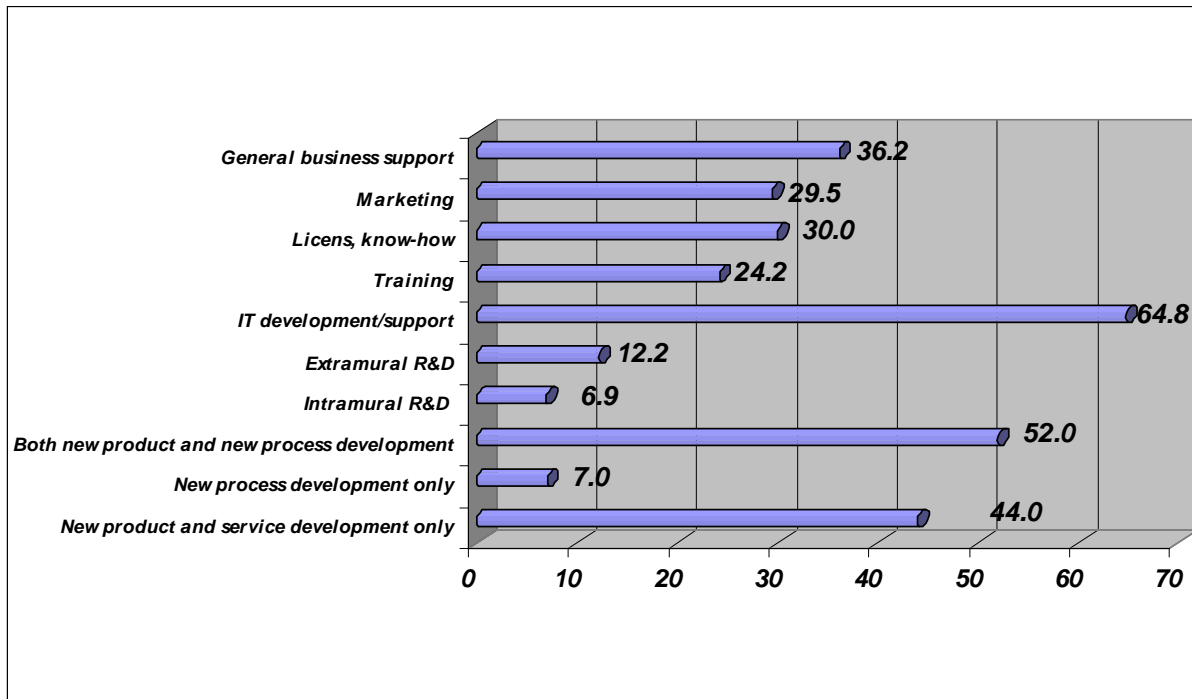
Figure 6: Importance of Sources of Knowledge

It terms who actually creates the knowledge within the firms, all of the respondents pointed out that their firms have neither R&D teams, nor R&D departments. Since the largest part of the innovations includes adoption of existing technologies, the interviewed stressed the importance and effectiveness of knowledge workers. However, the most important source of knowledge and innovation in the firm is the management. The survey found that, on average, almost of two-thirds of the firms report that the workforce has adequate skills for their needs.

According to the survey, every second Bulgarian SMEs has co-operated with national partner in knowledge creation and innovations. There have been indications from other studies that the process of opening SMEs to external – mainly European partners - is going on. However still it is known a little about the type of such collaborations. Existing studies point out that in the bulk of the cases the co-operation includes transfer of existing technologies rather than outsourcing. In addition, in terms of innovation culture, the respondents emphasized that the two of the most important factors are the core values of the firm and the innovative culture within the firm, which suggests that the firm will be innovative if the management team values the contribution of innovation to competitiveness, and among the workforce there is a culture which promotes innovation.

In terms of the types of knowledge the SMEs obtain from external sources, Figure 7 highlights the fact that the firms obtain a diverse range of knowledge but almost two-thirds of them spent efforts on IT development and acquisition of equipment. The group of important types of knowledge includes general business support, license, know-how and marketing knowledge, suggesting that it is the knowledge of running a business rather than developing products which is the most often obtained from external sources.

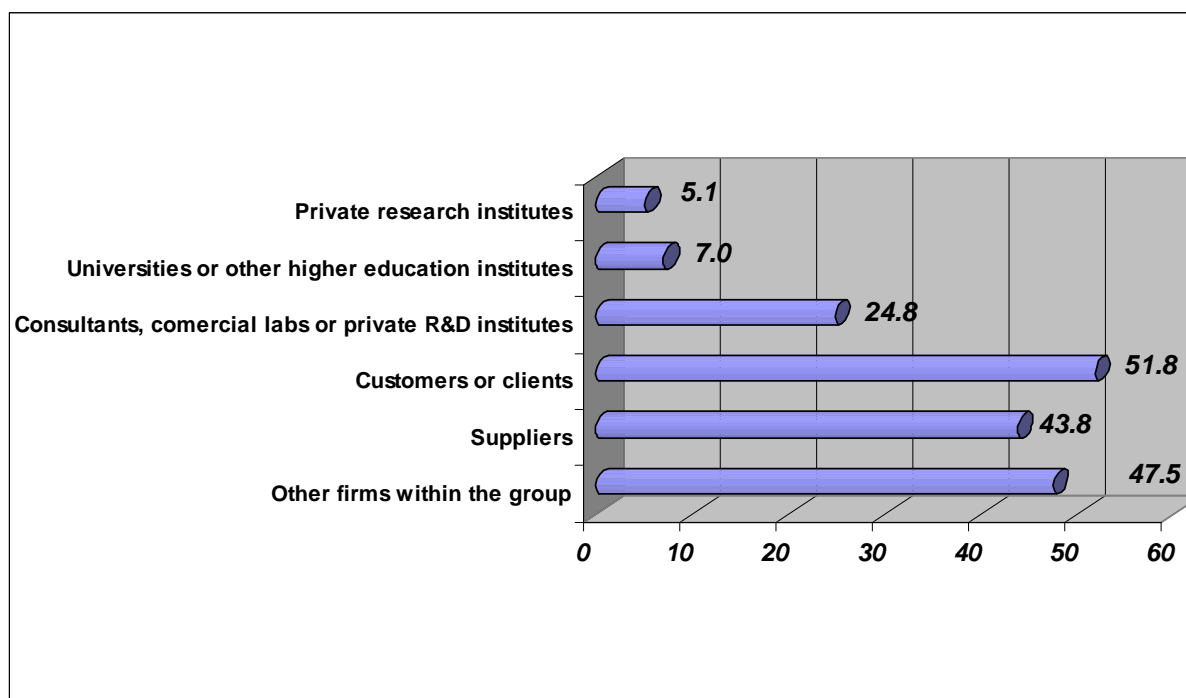
Figure 7: Types of Knowledge Obtained and Innovations Developed from External Sources (percent)



Recommendation 10	Rationale
Supporting firms in obtaining the crucial types of knowledge as general business support, license, know-how and marketing knowledge.	Currently only 6.9% and 12.2% of the surveyed SMEs report intramural R&D and extramural R&D respectively. These results once again confirm that for SMEs the R&D is less important than the access to the existing technologies.

Collaboration

Figure 8 presents data on collaboration and the importance of various partners to the firms. The most striking result appearing several times in the survey responses is the lack of interaction between knowledge creators and private sector - only 7% of the respondents found universities the most valuable partner in knowledge creation and absorption. The quality of science and higher education has been improving in recent years but it seems that the actors are not able to commercialize the results of these efforts. The customers and suppliers are rated as the most important collaborator, mirroring the result obtained with sources of external knowledge.

Figure 8: Importance of Collaborators (percent)

Overall, the sample firms appear to be well connected. Over three quarters report membership of a trade or business association, and over half of the firms report membership of local chambers of commerce. The survey data shows that obtaining and sharing knowledge are the most important factors with respect to the membership of networks. They suggest that the transfer of knowledge may be the most important factor influencing involvement and membership of network organizations.

Barriers and Future Policy Directions

The data from the interviews suggests that the major barrier faced by SMEs in carrying out R&D and innovations is the lack of financial resources. Reasonably the major priority for future policy according to the firm managers is to make finance available for firms to expand R&D and knowledge related activities (see Table 6). The fact that the interviewed placed the improving of system of business support and advice and improving the physical infrastructure and allowing companies to locate in better equipped premises on the second place in terms of share of suggestions to form the core of the policy indicates that SMEs sector in Bulgaria still needs support for its further expansion and sustainable growth. Half of the respondents suggested that creating more access to training and workforce development opportunities should form the core policy, thus supporting the view that SMEs still need a serious support to improve their capacity to innovate.

Table 6: Future policy directions (percent)

Future policy directions	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice	12.6	25.4	62.0
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	0.0	23.5	76.5
Creating more access to training and workforce development opportunities	13.0	36.0	51.0
Support companies in entering and accessing new markets	11.0	40.0	49.0
Create better networks that link companies with universities and other R&D performing organisations	15.0	38.0	47.0
Make improvements to the physical infrastructure allowing companies to locate in better equipped premises	12.0	26.0	62.0
Provide more support to companies to improve their supply-chains and logistical needs	23.0	39.0	38.0
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	13.0	48.0	39.0
Stimulate the creation of new start-up companies	11.0	62.0	27.0

Recommendation 11	Rationale
Finding the appropriate policy mix to support SMEs innovation and R&D investment.	One of the key MIRIAD interferences is that firms badly overstressed the possibility of support from the public sector. Due to the lack of long experience in market oriented environment, most of them prioritizes the financial support.

Based on the work so far we argue that the emphasis on SMEs in knowledge and innovation policy should continue without neglecting the policy concern for larger firms. On the one hand SMEs form increasingly important component of both national and regional economic structure being responsible for rising shares of output and employment. On the other hand SMEs face particular difficulties in innovation (mainly due to the economies of scale factors) that require different SME-tailored approach. In this line the following specific issues emerge from the survey results:

- lack of innovative capacity in traditional SMEs, including both managerial capacity to implement new ideas and innovative projects and worker capacity to create and implement knowledge and innovations;

- lack of financial resources and finding the appropriate policy mix to support SMEs innovation and R&D investment;
- lack of relationship between knowledge creators and SMEs and the inefficient role of intermediary organizations in this process;
- need for a more-coordinated and integrated approach to the delivery of services to SMEs that combine support and advising services at all stages of innovation process;
- need to discuss a more-sector specific support policy that will focus SMEs innovation policy on the infrastructural needs of regional SMEs clusters.

7. The Knowledge Networks of Universities and Other Research Institutions

The analysis of knowledge networks of universities and other research institutions summarizes the results from structured interviews of 20 key knowledge supply actors in the region and from a focus group, which was organized as a networking event. Participants of the event consisted of the representatives of the higher education and the other research oriented institutions.

The interaction with knowledge supply actors was aimed at:

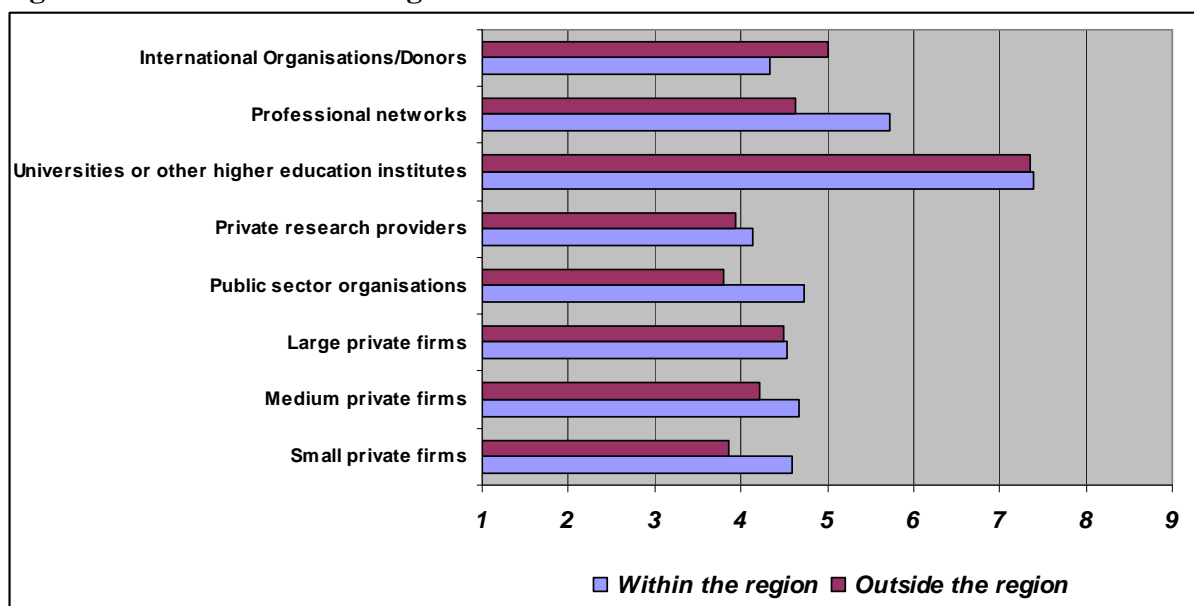
- exploring types of knowledge that is generated by these institutions and applicability of such knowledge and its transfer to SMEs;
- understanding how knowledge is currently transferred from the research to the SME community;
- identifying and understanding how knowledge creating institutions and intermediaries can be involved and in the future enhance knowledge transfer and infusion activities;
- gaining an understanding of the issues that the research community is facing when they are trying to engage with the SME community in regard to knowledge transfer and supply.

Knowledge Creation and Transfer

According to data reported training is the type of knowledge that is very often or often supplied to other stakeholders, followed by recruitment of skilled labor, general business support and IT development. Completely different is the situation in the area of health and safety advice, which is never supplied by more than half of the respondents. Advice on employment law, procurement of inputs, development of new markets, products, processes, services, and technologies are the types of knowledge that is never or not often supplied. The results also shows that the most important intellectual assets supplied are training programmes, websites and market knowledge, while the importance of typical intellectual assets as patents and copyrights is ranked as the lowest.

In terms of sources of knowledge, the highest rated source within and outside the region are “universities or other higher education institutes” (see Figure 9, where the rating was done on a scale 1-9 (lowest rank =1 and highest rank=9)). These knowledge sources are distributed almost equally within and outside the region. All other sources of knowledge, except the “other”, have a medium frequency of usage. Firms and organizations from private sector and professional networks are definitely more important sources of knowledge within the region rather than outside the region. Not surprisingly international organizations are the only high important source of knowledge outside the region. The basic locations of the outside sources are grouped into two main groups. The first group consists of the district centers located outside the MIRIAD region such as Veliko Tarnovo, Rousse, Pleven, Swishtov, Vratza, Vidin, and Montana. The second group includes locations outside the country and especially the EU countries.

Figure 9: Sources of Knowledge



In terms of human resources, the data show that the employees’ teaching skills, employees’ competence and employees’ consultancy skills are the most important factors affecting the organization’s competitiveness. It become clear that the management commitment is ranked relatively low, which indicates that the contribution of employee’s skills and competencies to the competitiveness of the organization are higher than the management commitment.

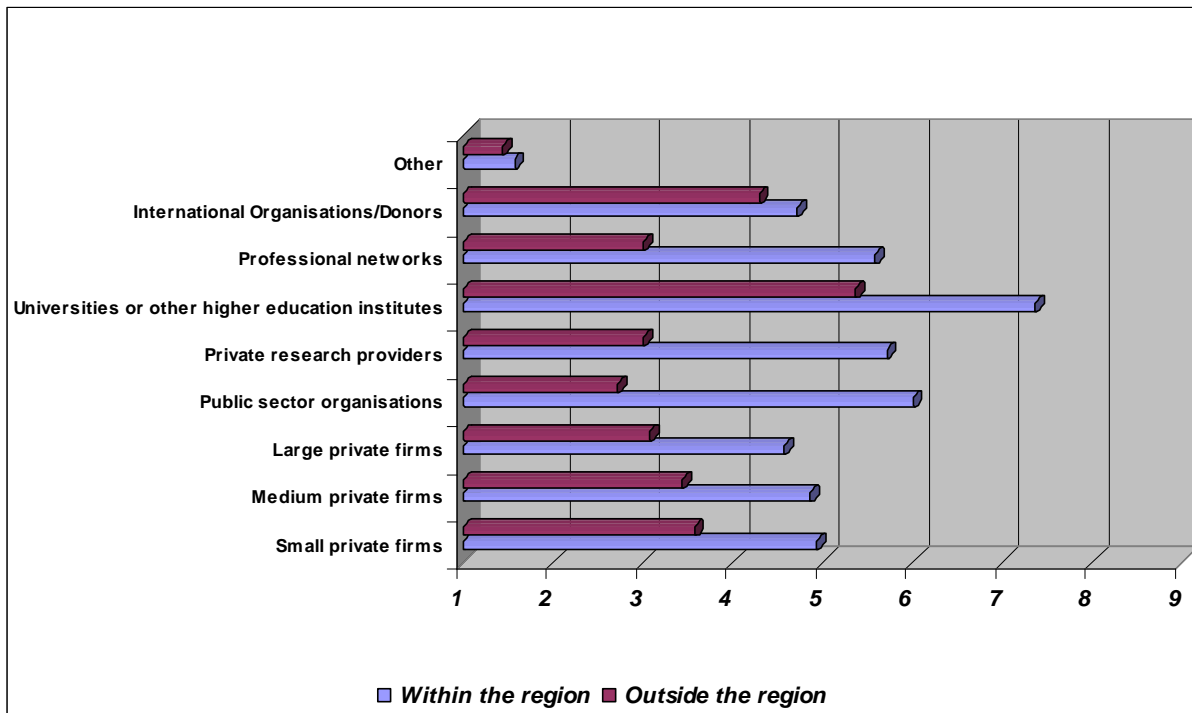
The data suggest that training materials are the most important and the most effective practices and routines, affecting the organizations’ capabilities to transfer knowledge to business. The second ranked item is library, whereas the lowest score is given to the customer project materials.

When considering the external relations of the knowledge transfer organizations, the following major characteristics could be outlined: In comparison to other external relations, the reputation of knowledge transfer organizations appears to be the decisive factor in terms of importance and effectiveness. The next three positions were obtained by information on an organization’s roles, presentation of their services, and the level of client satisfaction.

Interestingly the relatively low scores were obtained in the area of relationships and collaborations with business and other providers, which suggest that they are less significant in the knowledge transfer process.

Figure 10 presents the results concerning knowledge transfer to the different stakeholders. It highlights the fact that the recipients of primary importance are universities and other higher education institutes, public sector organizations, private sector organizations, and professional networks. The scores for all types of private firms are much lower, and this fact can be interpreted as an unfavorable in respect to the innovation capabilities and competitiveness of the firms.

Figure 10: Main Knowledge Recipients

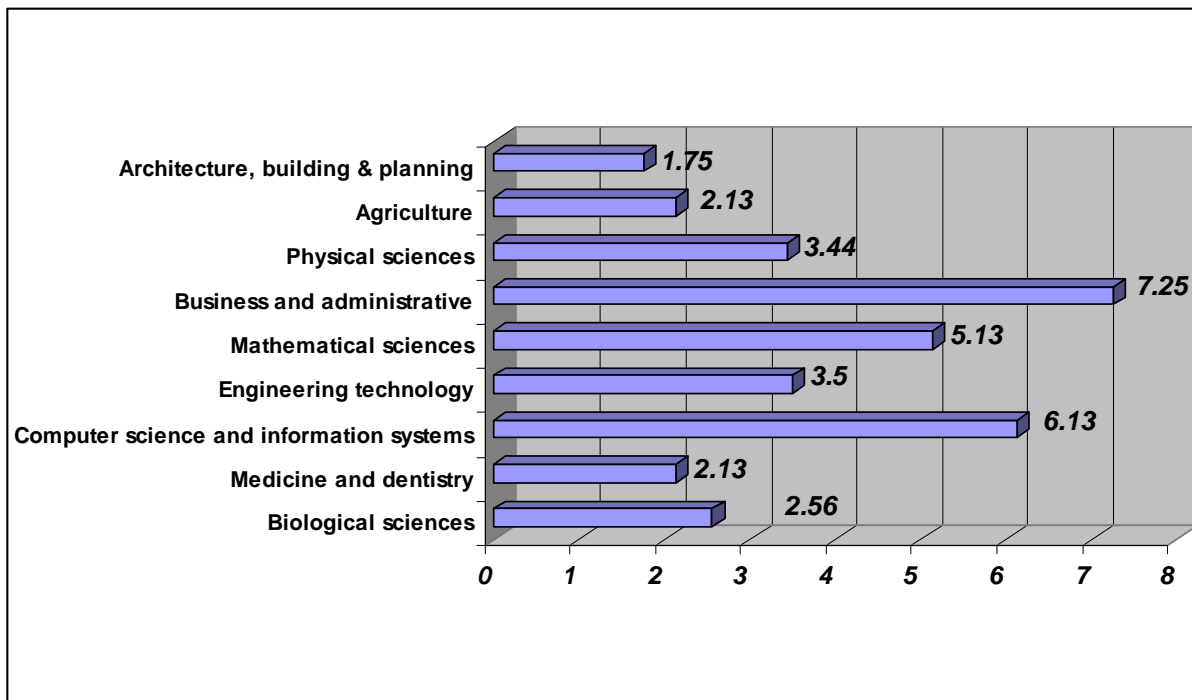


The knowledge transfer recipients are located mostly inside the region. Thus, the average scores for the agents outside are very low in absolute and in relative terms, due to the broad definition of the Bulgarian region for the project purposes, which has more than ¾ of all Bulgarian universities and other research centres. Similarly to the results, presented in Figure 9, the main outside knowledge transfer destinations are the district centres of the excluded planning regions, as well as the EU countries.

The interaction with business and professional organizations are of a high importance for knowledge transfer. The most important interaction seems to be improving university-business relations, whereas the effect on developing trust between research providers and companies is rated relatively low. The obtained results suggest that interaction at institutional level is rather high but the real collaboration with the firms is actually not happening. Leading positions among the various partners to knowledge transfer organizations occupy the international research institutions, followed by the professional organizations and the subject focused organizations. These data can be perceived as evidence that a relatively big part of

interactions relates to fundamental research, having little to do with the applications to SMEs. Figure 11 suggests that business and administration (e.g. logistics), and computer science and information systems are considered to be the most significant disciplines for knowledge creation. The rest of disciplines are not rated highly, and the lowest score is given to architecture, building & planning. Almost all of the respondents under the section ‘other disciplines’ added different fields of social sciences, with the average score, which is higher than in other disciplines, such as engineering technology and other fields of natural sciences.

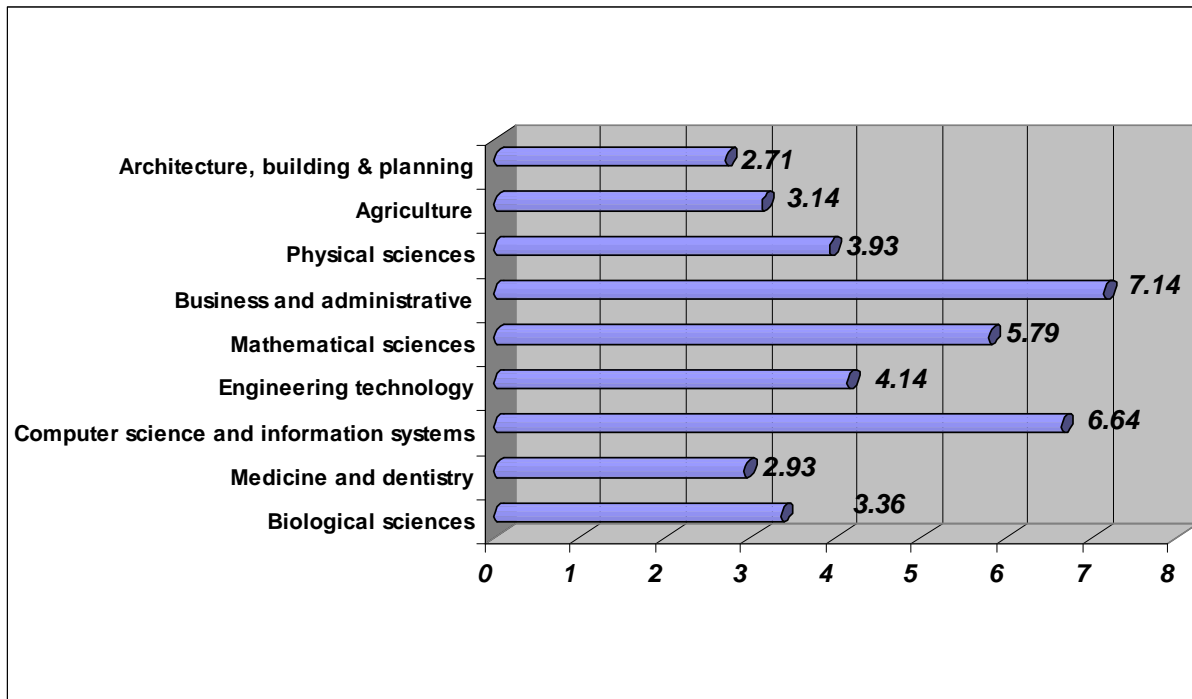
Figure 11: Importance of Academic Disciplines for Knowledge Creation



Regarding the importance of scientific disciplines in relation to knowledge transfer, Figure 12 shows that they are ranked in very similar way as the results in Figure 11. The obtained scores for a majority of disciplines are in this case higher, which denotes that they are of higher significance and contribute to knowledge transfer. The data from the interviews confirms the inference, drawing from knowledge supply analysis, that most of the scientific disciplines are not rated highly. Two exceptions here are again business and administration and computer science and information systems.

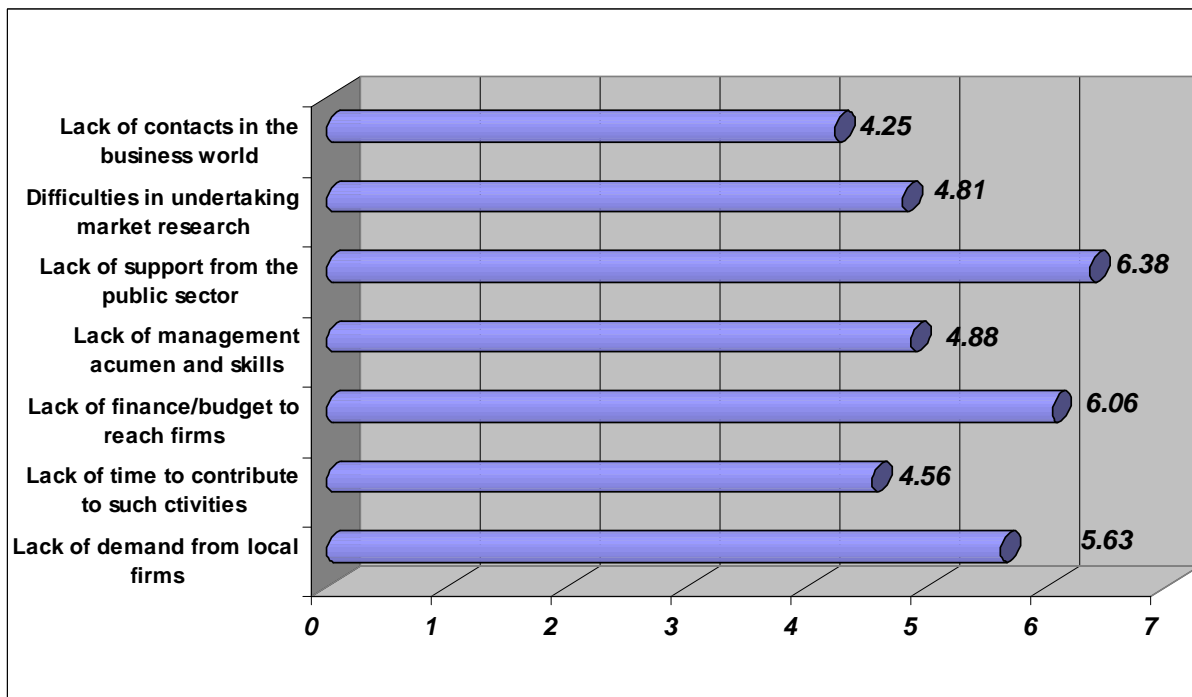
Recommendation 12	Rationale
Increasing number of the graduate students in the innovations-related subjects.	The majority of the interviewed universities and most of the Bulgarian universities supply knowledge mostly in the field of social sciences, which has little to do with the R&D and innovation potential.

Figure 12 – Importance of Academic Disciplines for Knowledge Transfer



Barriers and Future Support

Figure 13: Barriers to Knowledge Transfer

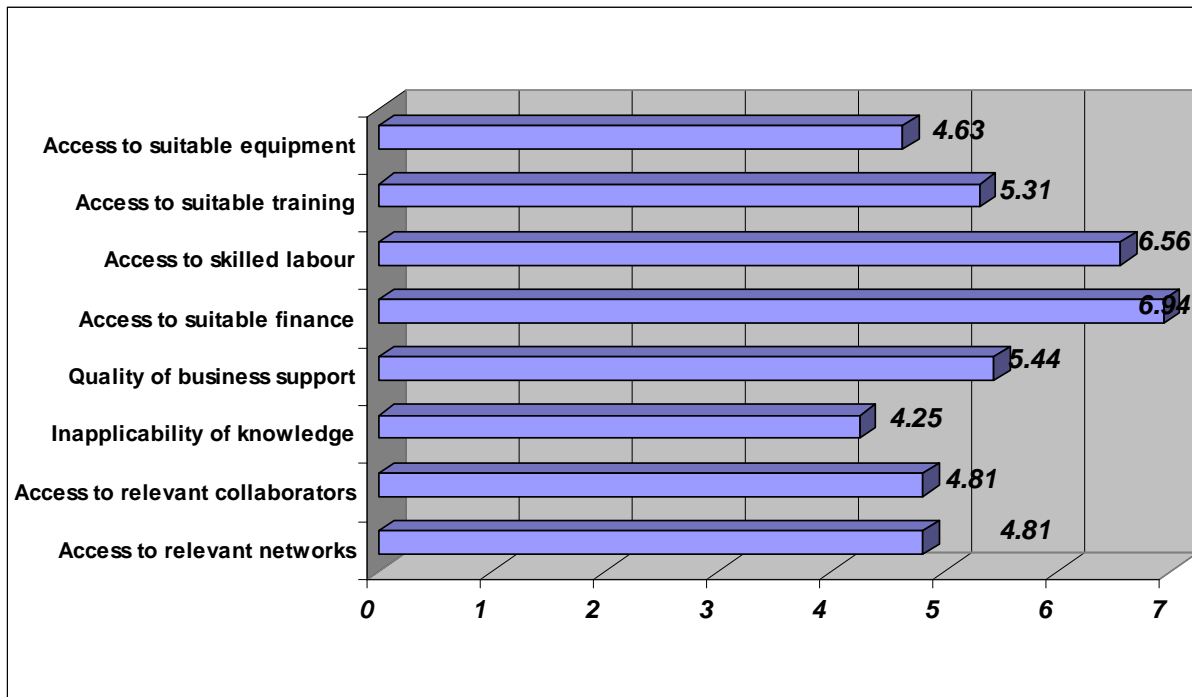


There are two types of barriers to knowledge transfer: barriers concerning knowledge transfer to firms, and barriers to acquiring or creating knowledge in the organizations which need to maintain or improve their competitiveness. This fact raises the problem concerning the areas of policy interventions that could help companies to acquire and develop knowledge needed for improving their performance.

Figure 13 suggests that over 50% of barriers to knowledge transfer are rated below 5 and consequently they are not classified as significant. The most important barrier faced by knowledge transfer organizations is a lack of support from the public sector, followed closely by a lack of finance/budget to reach many firms and a lack of demand from local firms. It should be pointed out that none of the barriers (except the item “other”) is ranked below 4, which means that these barriers are not significant. These data are indicative and suggests that the public sector interventions are necessary in regards to the knowledge supply process. In this case it is necessary to take into consideration the fact that a majority of the research institutions are still state-owned and subsidized, and therefore rely on the public support more than on knowledge transfer activities initiating by themselves.

In terms of barriers faced by firms, Figure 14 shows that the two most important barriers are the access to suitable finance and the access to skilled labor. The relatively high scores of the access to suitable finance and the access to skilled labor highlight the financial problems of most of Bulgarian firms, which suffer from the adverse demographic trends and the “brain drain” processes.

Figure 14: Barriers to Knowledge Creation Faced by Firms



According to the obtained data the priority for future policy should be a focus on creating better networks that link companies with universities and other R&D performing organizations – over 70% of the respondents suggests that it should form the core policy. The

other areas that seem to be of a high importance are the improvements to the physical infrastructure, closely followed by creating more access to training and workforce development opportunities. From the obtained data it becomes apparent that the universities and other research centers do not think that making finances available to firms or providing more support to companies to improve their supply-chains should form the core future policy.

Recommendation 13	Rationale
Extending and increasing the effectiveness of public support for encouraging the applied research and the R&D inducing structures (entrepreneurship centers, research and development sectors, etc.) within the universities.	Currently the universities are focusing mainly on education and do not pay sufficient attention to business oriented research activities. The national innovation policy stakeholders try to overcome this demerit through providing training in entrepreneurship, and giving a financial support by national and EU supported projects. The future success of these activities will depend on the universities' own abilities to establish useful internships with the business.

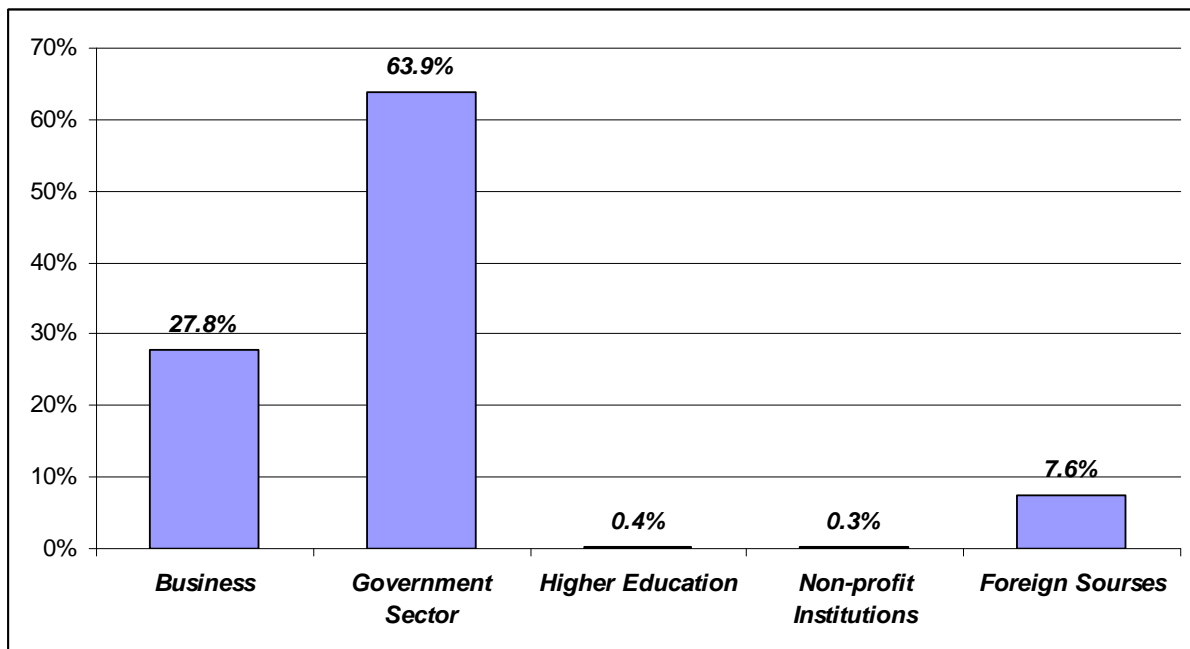
Based on the obtained data from the interviews and discussions, the following issues concerning the knowledge supply and the knowledge transfer can be outlined:

- knowledge supply and transfer are clearly dominated by training activities and training programs, suggesting that training is the most important knowledge type and the crucial intellectual asset in the region;
- the traditional research institutions carry out lots of research work in the area of fundamental sciences, whereas the applied research is of a secondary importance;
- most of institutions pointed out that teaching skills, competence and consulting skills as the most important items in the human resources field;
- in the area of external relations reputation is considered to be of high importance for knowledge suppliers, whereas the responsiveness to beneficiary demands, and relationships with beneficiaries are considered to be less significant;
- the main knowledge recipients are universities and other higher education institutes, whereas the private sectors firms are rated to be of less importance;
- The research institutions closely interact with major business and professional institutions, however the interaction is happening mainly on the institutional level;
- the main barrier to knowledge transfer for the knowledge suppliers is a lack of public support, while the main barrier for firms is the lack of financing and access to skilled labour.

8. Financing the Knowledge Economy

The investment in innovation represents the spending on the creation (or adaptation) of innovation, technological and/or research products in the country. Its major element and measure is the spending on research and development (R&D) in the region. Investment in innovation is related to the technological intensity, depth and quality of the physical capital generated by domestic and foreign investment. FDI, together with the import of goods, represent indirect transfers to the country of R&D spending made abroad. Investment in innovation depends on the functioning of the whole innovation system but it is most closely linked to the availability and diversity of mechanisms for financing, including venture capital. The direct financial commitment of the government to R&D makes investment in innovation an important pillar of the national and regional innovation policies.

Figure 15: R&D and Innovation Expenditure by Source



Currently the efforts of the Bulgarian government are targeted at creating conditions for introduction of innovations resulting from industrial research. The process is supported by both public funds and private funding. The state seeks to create conditions conducive to undertaking higher risk and investment in market oriented products by the entrepreneurs. National Innovation Strategy (2004) and National Strategy for Science, Research and Development (2005) are the two recently elaborated policy documents that define the legal and financial framework for R&D and innovations in Bulgaria.

The main novelty introduced by the National Innovation Strategy is the establishment of the National Innovation Fund with the main task of financing market-oriented R&D and innovation activities of the private sector. National Innovation Fund together with the National Science Fund managed by the Ministry of Education and Science bring competition to the procurement of public funding for research and innovation that is well established

practice in developed market economies. At the current stage there are still not enough data on the utilizations and effectiveness of these funds. According to the National Innovation Strategy, the National Innovation Fund is the main financial instrument which started functioning in 2005. The main objective of the fund is to increase the competitiveness of Bulgarian economy through the encouragement of market oriented applied research and creation of conditions conducive to the public investments in innovations. The operational goals of the National Innovation Fund are: (i) to stabilize part of the costs for market oriented applied research and R&D projects; (ii) intended to be implemented in the industry; (iii) to fulfill the measures, stated in the NIS; (iv) to make use of the opportunities which are provided by the Law aimed at supporting the innovative companies. Two kinds of projects are eligible to apply for the fund: scientific applied research projects and feasibility studies.

The own resources of enterprises has been and continue to be the main source of financing for their innovation activities, followed by banks and domestic and foreign partners. EU funds are expected to increase their share after the EU accession and the further deepening of financial intermediation in the Bulgarian economy. Unfortunately the specialized instruments for innovation financing such as venture capital funds are practically unknown to Bulgarian innovative enterprises. In 2006, more than three-quarters of Bulgarian companies financed their innovation with their own resources. We expect that the role of the EU funds and of the banking sector will increase in the following years. Their effect will be promoted by the emergence of venture capital funds, which are envisaged for financing from the EU funds in the country and in the region. Bank loans are the second largest source of financing for the innovation activity of Bulgarian enterprises.

But we should stress that the use of venture capital funds for financing of innovation projects is still rather limited in Bulgaria. According to the survey of the Innovation Relay Centre at the Applied Research and Communications Fund which was conducted by the agency "Vitosha Research" in 2006, the answer "venture capital funds" to the question "sources of financing for innovation" was mentioned at first place by none of the respondents; one respondent ranked it second and two respondents ranked it third. Bulgaria already offers opportunities for entry of external venture capital funds into the country. According to a survey of the global venture capital, European companies are the major possible source of venture capital for Bulgaria. They intend to invest 14 % of their additional capital in Central and Eastern Europe.

Recommendation 14	Rationale
To develop and promote the new incentives and sources for venture capital in the region from public, private and foreign sector.	The government is not providing enough incentives for the venture capital usage. The low-risk profile of bank financing makes it accessible only for lower-risk investment projects which avoids the possibility for creating a venture capital. A relatively very small share of FDI and EU funds has been devoted for venture capital activities.

9. Analysis of Key Findings

One of the key MIRIAD findings is that SMEs in Bulgarian region rely more on the tacit knowledge of their human resources rather than on their formal qualifications (codified knowledge). At the same time during the SMEs study it has been realized that there is no official statistical data on the formal education qualifications of their employees. Therefore one can not get a clear picture of the innovation and competitiveness opportunities of different groups of SMEs (sectoral, geographical), based on formal competence alone. Since in the coming years the development of competence as a competitive factor in small firms will be a central challenge it is crucial to analyze further the competence requirements (both codified and tacit) of firms involved in the innovative activities.

Recommendation 15	Rationale
Developing further and extending the measurement of both codified and tacit knowledge stock of SMEs, affecting their overall competitiveness.	Benchmarking knowledge assets as an important part of knowledge demand analysis is a necessary conditions for the elaboration of innovation policy on different levels.

It has become clear during the consultations undertaken that physical resources are generally the least important factors for the competitiveness of SMEs with the exception of plant equipment. This fact together with the high importance of connections with customers and suppliers indicate that Bulgarian SMEs are facing mainly with problems of survival and business extension and put still less emphasis on the role of knowledge to the firms' competitiveness. This result suggests that one major problem for SMEs and for government to find the appropriate policy initiatives to solve it, is the incapability of firms to incorporate innovation strategy into the overall business development strategy.

Recommendation 16	Rationale
Placing special emphasis on the consultancy services, addressed to develop innovation strategies and thus to encourage R&D investments of SMEs.	It seems to be of great importance to persuade business that innovation strategies developing and their implementation will be rather useful for their overall competitiveness and development.

In terms of knowledge creation, the factor rated as most important within the firm was the management team. Firm will be innovative if the management team values the contribution of innovation to competitiveness, and among the workforce there is a culture which promotes innovation. During the focus group and interviews however participants stressed that many SMEs, especially traditional ones, are lacking management capacities to implement new ideas and innovative projects.

Recommendation 17	Rationale
Providing training for management and giving them information about the good practices in innovation activities.	It can be done through: i) organizing the special courses at the universities; ii) participation in some initiatives of international consultancy groups, which has already expressed their interest to encourage the innovation and to invest in venture capital in Bulgaria.

The results from the interviews have shown that the top two external sources of knowledge for SMEs in South-Eastern Bulgaria, as well as the most important factors for collaboration, are customers and suppliers. This finding suggests that innovation and knowledge creation in the region is not supply-driven. One of the most striking finding stemming from the interviews is the extremely low importance of traditional knowledge creators such as universities and private research institutes. The lack of co-operation between academia and SMEs suggests that public intervention should be aimed at removing the barriers between the two sectors. Currently universities lack incentives and legal mechanisms to cooperate with private sector. Changes in the legal framework in which universities and other research institutions operate, for example towards their third mission, would address the knowledge and innovation needs of SMEs better. Despite the fact that the firms are well connected in terms of membership of networking organizations according to the survey data, an appropriate measure are necessary in order to set up and developed the intermediary system to close the gap between the knowledge creators and SMEs.

Recommendation 18	Rationale
Inducing the more intensive networks between SMEs and intermediary organization, which have to be realized on a real base.	Nowadays the obtaining and sharing knowledge are considered to be the most important factors with respect to the membership of networks. However the interaction has been carried out mostly at institutional level, while the real collaboration in R&D activities is rather scarce.

It was found during the MIRIAD activities that the major factor hampering SMEs in carrying out R&D and innovations is the lack of financial resources. It has to be stressed here that when respondents are asked about the role of finance in the innovative activities, the respondents predominantly think about internal resources. This is due to the current very low public financial support to the SMEs in this area. And there is still a large room for improvement and finding the appropriate mechanisms. When committing resources to innovation SMEs spend more as a proportion of their turnover than larger firms and reasonably face higher risks. During focus group most of the participants pointed out the lack of well-functioning venture capital or seed finance market to support their research and development efforts, and their investments in innovations are considered to be the main barriers for investments in R&D. The main priority for future policy according to the firm managers has been proved to be making finance available for firms to expand R&D and knowledge related activities.

Recommendation 19	Rationale
Making more finance available to SMEs enabling them to become involved further in R&D and knowledge related activities	The public support can take the following forms: i) direct funding by central authorities (National Innovation Fund especially), and ii) creating financial incentives through fiscal stimuli, attracting the bank credit lines, and attracting the venture capital.

It is interesting that uncertain demand for innovation products and services appears to be a substantial factor hampering innovative activities in SMEs. This finding suggests that the general economic environment in the country does not stimulate the production of innovative products and services. Hence one of the avenues of promoting innovation is to convince SMEs that they will benefit from the results of their research efforts. The fact that interviewed placed the creating of an improved system of business support and advice, and improving physical infrastructure and allowing companies to locate in better equipped premises on the next place in terms of share of suggestions to form the core of the policy indicates that SMEs sector in Bulgaria still needs support for its further expansion and sustainable growth.

It has to be taking into consideration that because of broadly defined Bulgarian MIRIAD region the prevailing part of external sources of knowledge comes from places inside the region, as well as the most important network partners are also situated here.

10. Future Policy Approaches

In order to achieve the main aims of the MIRIAD project, different innovation actors in the region (SMEs, research organizations and universities, intermediaries, and public administration) have been studied and involved in finding out what is needed to encourage the R&D investments. One of the key conclusions coming from the analysis undertaken is that innovation is a result of co-operation, interaction and mutual learning between different actors within the region rather than a result of linear process where knowledge actors receive support from the state and the local authorities. Staying in line with this conviction and having in mind the main characteristics of the innovation system and the key findings of the project, the following future policy directions considering R&D investments might be summarized:

First: Future R&D and innovation policy has to be addressed to fulfill both quantitative targets, set by the optimistic scenario (based on targets set out by National Innovation Strategy) or at least by the moderate optimistic scenarios (whereby the region goes on with slightly higher trend), and qualitative targets, related to improving the overall organization of national and regional innovation systems. The quantitative targets will manifest themselves through changing the role of different actors in the innovation process, as well as through encouraging the network between them. The important step in these lines is to convince SMEs, intermediaries and knowledge creators that R&D and innovation investments have to be accepted as important factors affecting their medium-run and long-run growth and competitiveness. In such a context it has to become clear that the trade off between short-run economic performance (concerning cost-benefit ratio) and long-run economic development is almost unavoidable).

Recommendation 20	Rationale
Changing the organization of national innovation system as a necessary condition for achieving the better quantitative results.	The existing linkages between different innovation actors are rather sophisticated – with both interactive and recursive terms included, as well as with a little evidence of direct knowledge flow.
Recommendation 21	Rationale
Giving more information to innovation actors and especially to SMEs about the future positive effects of current increase in R&D investments.	Innovation actors try to reach mostly short-run aims and usually experience lack of financial resources, which explains why their innovation related activities can be described as rudimentary and scarce.

Second: The future R&D investments policy has to be more sectoral specifically oriented, because this is considered to be the most effective way for increasing the sectoral competitiveness. This kind of policy has to be in accordance with both the priority of some sectors, defined by the economic policy, and with the announced by the European Innovation Survey differences in innovation styles of different sectors (the high-tech and medium-high tech manufacturing innovate through knowledge creation, while service sector and low-tech manufacturing stress knowledge diffusion). One of the priorities of R&D investments policy has to be the usage of cluster approach aiming to establish and to develop the cluster structures in the country. It is expected that the cluster approach implementation will encourage the creation of innovation products within the cluster and all over the region

Recommendation 22	Rationale
Developing of targeted innovation policies for the prioritized sectors as tourism, energy, agriculture, telecommunications, high-technologies, and infrastructure.	Revealing different types of innovators and innovating styles, and conducting targeted innovation policies will avoid the danger (especially in some parts of the region) of falling into the technological trap.
Recommendation 23	Rationale
Reassuring the creation of new and the development of the existing cluster structures, and stimulating their R&D activities.	Currently there are 9 existing clusters of the region, and the process of new cluster creation is ongoing. Since the development of new clusters will realized under a PHARE project implementation, the national and regional policy will be directed towards providing the needed institutional support.

Third: The R&D and innovation policy should target also the main tasks of the universities and the other research institutions. The knowledge creators have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firms. Since the legislation that currently regulates research does not stimulate its commercialization and capitalization, the first step towards the commercialization has to be changing the legal framework. As far as the educational system is concerned, the next step

could be redesigning the curricula in order to meet the firms' demand, because the current education system is not flexible enough to adapt to a continuously changing technological and economic environment.

Recommendation 24	Rationale
Stimulating knowledge creation and flow of the universities through elaboration of the legislation, creation of spin-offs, and making curricula more practically oriented.	The realization of these measures needs more intensive interrelations between universities and professional and branch organizations, more innovation culture of the universities, and more convictions by the responsible authorities.

Fourth: The policy should help the intermediary organizations to become aware of their own capacity to induce more active innovation collaborations between knowledge creators and SMEs, as well as to initiate such collaborations by themselves. The common impression is the intermediaries as regional development agencies, commercial chambers, regional and branch associations, technology transfer centers, business innovation centers, and other organizations supporting SMEs intermediaries are being able to use more intensively their closer relations to business in order to promote the knowledge flow. The policy incentives could range from giving more information about the good practice to involving intermediaries in the discussions serving policy developments.

Recommendation 25	Rationale
Emboldening the R&D activities of the intermediary organizations and the efficiency of their usage in the innovation process.	The intermediary organizations usually tend to undervalue their own role in transfer of knowledge and innovations to the enterprise sector. If some of them realize this important role, they do not accept the R&D transfer and absorption as one of their key priorities.

Strategy Status

Bulgaria regional policy is already fairly well established on the level of planning regions and especially on the Bulgarian MIRIAD region, covering the most developed four regions out of six. Nowadays there is only one active regional innovation strategy for the South-Central Region. In all the other regions the process of creating their own regional strategies is still ongoing. It is not the aim of the MIRIAD project to add another unnecessary addition to the existing stock. But the MIRIAD Bulgarian regional strategy has been distributed to all policy makers both on the national and regional levels. The advantage of this strategy is that it is applying the innovation ideas on a new scale – the Bulgarian MIRIAD region.

11. Summary of Recommendations

The following summarizes the recommendations proposed by this study:

Recommendation 1	Rationale
To provide more reliable statistical base for in-depth analysis of innovativeness of specific sectors as a necessary condition for the innovation policies conducting.	Currently Bulgaria is taking part in the European Innovation Survey but only with a number of indicators, mainly those related to <i>transmission and application of knowledge</i> , but the data for <i>innovation finance, output and market</i> are not provided.
Recommendation 2	Rationale
To create an innovation culture of a broader understanding beyond the R&D framework.	Three different types of innovation and technology management competencies have to be considered: <ul style="list-style-type: none"> - technological competence: the ability to chose, adopt and manage specific technologies that are the most relevant to SMEs' needs; - entrepreneurial competence: the ability to generate and implement innovation strategies that are indispensable part of the overall business strategy of the given SME; - learning ability: the ability to adapt the firm organization and personnel culture to the conditions necessary for accommodating technological changes and innovations.
Recommendation 3	Rationale
To establish a better and more efficient coordination between the National Innovation Strategy and RIS.	The institutional relations among the different regional authorities and the national bodies engaged in the process should be put in the appropriate legal framework.
Recommendation 4	Rationale
Changing legal framework towards commercialization of knowledge and research activities at the universities and the other research centers.	The ability and willingness of the region's higher education sector to prioritize its business relations, and to create much closer relations with the business structures.
Recommendation 5	Rationale
Participation of the institutions from the region in the European and global initiatives and access to European programs such as ISPA, SAPARD, PHARE, 6 & 7 Framework Programs, etc.	The delay in the implementation of national and regional innovation strategies may be overcomes by creating the appropriate structures providing guaranteed access to different EU funds.
Recommendation 6	Rationale
To consolidate the quantity and quality of the knowledge demanded by the regional SMEs on a larger base and thus to increase the competitiveness	A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness.

among them.	
Recommendation 7	Rationale
To create new bodies and improve the existing ones of business support infrastructure, thus avoiding the informal contacts between the SMEs and the knowledge creators and reducing the excessive bureaucracy.	There are some national institutions, but it is a time to hurry up with the creation of regional ones and especially with the university structures for advising and consulting the SMEs.
Recommendation 8	Rationale
Encouraging SMEs to use typical intellectual assets such as patents, copyrights, and trademarks.	The necessary precondition is to provide adequate, efficient and high-quality protection of intellectual property by improved legal framework for enforcement of intellectual property rights.
Recommendation 9	Rationale
Supporting SMEs to expand and to increase their competitiveness in general and to improve the innovation capacity in particular.	It is assumed that the more effective usage of the current resources will act as a driving force towards increasing the R&D investments and thus to improve the long-run competitiveness.
Recommendation 10	Rationale
Supporting firms in obtaining the crucial types of knowledge as general business support, license, know-how and marketing knowledge.	Currently only 6.9% and 12.2% of the surveyed SMEs report intramural R&D and extramural R&D respectively. These results once again confirm that for SMEs the R&D is less important than the access to the existing technologies.
Recommendation 11	Rationale
Finding the appropriate policy mix to support SMEs innovation and R&D investment.	One of the key MIRIAD interferences is that firms badly overstressed the possibility of support from the public sector. Due to the lack of long experience in market oriented environment, most of them prioritizes the financial support.
Recommendation 12	Rationale
Increasing number of the graduate students in the innovations-related subjects.	The majority of the interviewed universities and most of the Bulgarian universities supply knowledge mostly in the field of social sciences, which has little to do with the R&D and innovation potential.
Recommendation 13	Rationale
Extending and increasing the effectiveness of public support for encouraging the applied research and the R&D inducing structures (entrepreneurship centers, research and development sectors, etc.) within the universities.	Currently the universities are focusing mainly on education and do not pay sufficient attention to business oriented research activities. The national innovation policy stakeholders try to overcome this demerit through providing training in entrepreneurship, and giving a financial support by national and EU supported projects. The future success of these activities will depend on the universities' own abilities to establish useful internships with the business.

Recommendation 14	Rationale
To develop and promote the new incentives and sources for venture capital in the region from public, private and foreign sector.	The government is not providing enough incentives for the venture capital usage. The low-risk profile of bank financing makes it accessible only for lower-risk investment projects which avoids the possibility for creating a venture capital. A relatively very small share of FDI and EU funds has been devoted for venture capital activities.
Recommendation 15	Rationale
Developing further and extending the measurement of both codified and tacit knowledge stock of SMEs, affecting their overall competitiveness.	Benchmarking knowledge assets as an important part of knowledge demand analysis is a necessary conditions for the elaboration of innovation policy on different levels.
Recommendation 16	Rationale
Placing special emphasis on the consultancy services, addressed to develop innovation strategies and thus to encourage R&D investments of SMEs.	It seems to be of great importance to persuade business that innovation strategies developing and their implementation will be rather useful for their overall competitiveness and development.
Recommendation 17	Rationale
Providing training for management and giving them information about the good practices in innovation activities.	It can be done through: i) organizing the special courses at the universities; ii) participation in some initiatives of international consultancy groups, which has already expressed their interest to encourage the innovation and to invest in venture capital in Bulgaria.
Recommendation 18	Rationale
Inducing the more intensive networks between SMEs and intermediary organization, which have to be realized on a real base.	Nowadays the obtaining and sharing knowledge are considered to be the most important factors with respect to the membership of networks. However the interaction has been carried out mostly at institutional level, while the real collaboration in R&D activities is rather scarce.
Recommendation 19	Rationale
Making more finance available to SMEs enabling them to become involved further in R&D and knowledge related activities	The public support can take the following forms: i) direct funding by central authorities (National Innovation Fund especially), and ii) creating financial incentives trough fiscal stimuli, attracting the bank credit lines, and attracting the venture capital.
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Giving more information to innovation	Innovation actors try to reach mostly short-run

actors and especially to SMEs about the future positive effects of current increase in R&D investments.	aims and usually experience lack of financial resources, which explains why their innovation related activities can be described as rudimentary and scarce.
Recommendation 22	Rationale
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Recommendation 23	Rationale
Reassuring the creation of new and the development of the existing cluster structures, and stimulating their R&D activities.	Currently there are 9 existing clusters of the region, and the process of new cluster creation is ongoing. Since the development of new clusters will realized under a PHARE project implementation, the national and regional policy will be directed towards providing the needed institutional support.
Recommendation 24	Rationale
Stimulating knowledge creation and flow of the universities through elaboration of the legislation, creation of spin-offs, and making curricula more practically oriented.	The realization of these measures needs more intensive interrelations between universities and professional and branch organizations, more innovation culture of the universities, and more convictions by the responsible authorities.
Recommendation 25	Rationale
Emboldening the R&D activities of the intermediary organizations and the efficiency of their usage in the innovation process.	The intermediary organizations usually tend to undervalue their own role in transfer of knowledge and innovations to the enterprise sector. If some of them realize this important role, they do not accept the R&D transfer and absorption as one of their key priorities.