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The Innovative Bulgarian Companies

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CONTENTS

LIST OF ABBREVIATIONS

AA	– Agricultural Academy
AD	– Joint-Stock Company
BAS	– Bulgarian Academy of Sciences
BGN	– Bulgarian Lev
BTC	– Bulgarian Telecommunications Company
CEE	– Central and Eastern Europe
COSME	– Programme for the Competitiveness of Enterprises and SMEs 2014 – 2020 of the European Commission
CRM	– Customer Relationship Management
DG	– Directorate General
EAD	– Single-Member Joint Stock Company
EAFRD	– European Agriculture Fund for Rural Development
EC	– European Commission
ECSC	– European Coal and Steel Community
EEA	– European Economic Area
EGA	– European Generic Medicines Association
EIS	– European Innovation Scoreboard
EMFF	– European Maritime and Fisheries Fund
EOOD	– Single-Member Limited Liability Company
EPO	– European Patent Office
ERA	– European Research Area
ERDF	– European Regional Development Fund
ERP	– Enterprise Resource Planning
ESF	– European Social Fund
EU	– European Union
FDI	– Foreign Direct Investment
GDP	– Gross Domestic Product
GVA	– Gross Value Added
HR	– Human Resources
HS	– Higher School
ICT	– Information and Communication Technologies
IPC	– International Patent Classification
IT	– Information Technologies
ITER	– International Thermonuclear Experimental Reactor
IUS	– Innovation Union Scoreboard
NACE	– Statistical Classification of Economic Activities in the European Community
NCPR	– North Central Planning Region
NEPR	– North-East Planning Region
NGA	– Next-Generation Access
NHIF	– National Health Insurance Fund
NIF	– National Innovation Fund
NSI	– National Statistical Institute
NUTS	– Nomenclature des Unitūs Territoriales Statistiques
OOD	– Limited Liability Company
OP	– Operational Programme
PHARE	– EU Pre-Accession Programme "Poland and Hungary: Support for Restructuring of their Economies"
PORB	– Patent Office of the Republic of Bulgaria
R&D	– Research and Development
R&I	– Research and Innovation
RFID	– Radio Frequency Identification
RFCS	– Research Fund for Coal & Steel
RTP	– Registered Traveller Programme
SCPR	– South Central Planning Region
SEPR	– South-East Planning Region
SJR	– SCImago Journal Rank
SMEs	– Small and Medium-Sized Enterprises
SU	– Sofia University
SWPR	– South-West Planning Region
TBGN	– Thousand Bulgarian Levs
TRIP	– The Agreement on Trade Related Aspects of Intellectual Property Rights
USA	– United States of America
USPTO	– US Patent and Trademark Office

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EXECUTIVE SUMMARY

National Innovation Policy

Initiatives at the European level and the experience of developed countries in the field of scientific, technological and innovation policy suggest **that innovation-oriented practices are the only possible approach to sustained competitiveness.**

As a number of international indices and rankings indicate, a typical feature of innovation leaders is a well-functioning innovation ecosystem built on the basis of a streamlined interaction among stakeholders, investment in human capital and a developed innovation infrastructure. The lack of such growth-enabling factors in the other countries creates **a pronounced dividing line between innovation leaders and followers** – a divider which gains an ever increasing importance, to the extent that it starts to substitute the familiar categories of "developed" and "developing" countries.

The main findings of this report are that **Bulgaria is expected to improve its innovation performance**, mainly in the field of incremental innovation, while still lagging behind the average EU-28 level.

Despite the ambitious strategic framework adopted for the new EC programming period 2014 – 2020, a number of problems persist:

- The innovation potential of the Bulgarian economy is driven primarily by the impact of external factors (European structural financing, EC pressure for developing an innovation-oriented policy framework), and despite obstacles at the national and local levels (lack of understanding among policymakers of the importance of innovation; low administrative capacity; lack of mechanisms for promoting entrepreneurial and innovation culture; corruption).
- The series of misappropriations of public funds intended for science have done unpunished.
- There is no comprehensive vision on the priorities of the national economy and the innovation system in particular, resulting in ad hoc policies

and inconsistent and unsustainable measures for their enforcement. The input indicators of the national innovation ecosystem and of its functioning vary significantly from year to year, thus highlighting the precariousness of the Bulgarian innovation policy, which has no clear direction and parameters.

R&D spending in Bulgaria rose by about 26 % in 2014 as compared to the previous year – the highest growth of this indicator since 2000, mostly as a result of the participation of private sector companies in international value added networks. Since 2010, **the main sources of R&D investment have been foreign investments and the European structural funds, the importance of which for the national economy has grown**. In 2014, this trend continued and their share in the total R&D spending reached over 51 %. Given its pull effect in terms of business expenditure for R&D, **external financing becomes central to the existence and development of the national research and innovation system.**

On the basis of data from the European Innovation Management Academy, *Innovation.bg 2015* analyses the strengths and weaknesses of Bulgarian companies in commercialising innovation. Although 80 % of companies have innovation strategies, they are rarely communicated clearly to company staff. While such strategies have the potential to focus the use of limited resources, their full effect cannot be achieved if staff, business partners and clients are not sufficiently aware of them. Bulgarian companies have a lower level of readiness for organisational and cultural innovations compared with companies from other countries. Data on the innovation cycle indicate that Bulgarian SMEs are on par with companies from other countries with respect to the generation of ideas but seek to associate their innovation strategies with processes that potentially hamper the achievement of good commercialisation results.

The Bulgarian ICT sector continues to be a key source of national competitiveness, making up 10 % of exports and over 6.5 % of GDP. In 2015, Bulgaria won the European Outsourcing Association award in the category "Offshoring Destination of the Year" by generating investment in cities other than the capital – mainly Plovdiv, Varna and Bourgas – thus creating expectations for increased employment in this sector. In addition to higher remuneration of staff, some companies outsourced their R&D in the country. In this context, it is worrying that the government took a position in favour of the status quo and against innovation in a landmark case against a shared travel company, regardless of the fact that the company had established a R&D unit in Bulgaria.

While business enterprises have internal drivers for growth generation, supported further by European financing, **higher education is the component of the national innovation ecosystem sustaining the heaviest adverse effects**:

- **For a fifth year in a row, the R&D budget of the higher education sector is decreasing.** In 2014, spending through university research funds for R&D was halved, while the decrease compared to the peak 2009 was 90 %. The intention to make education a priority in the 2016 budget is a step in the right direction provided it is sustained in the long term until 2030.
- A worrying sign is the extremely low patent activity of **the higher education sector**. Only 8 out of 51 higher education institutions have registered patents. In 2014, for a second year in a row there was a **fall in the number of research publications**.
- **While universities form the largest share of beneficiaries in EU-28, in Bulgaria they hold the fourth (last) place among the institutional sec-**

tors with only 9 higher education institutions receiving financing under Horizon 2020.

- In 2014, **for the first time in the last seven-year period there was a reduction in the number of graduates with bachelor's (-7 %) and master's (-3 %) degrees,** resulting from the continued reduction of the number of students over the recent years. Evidently, Bulgarian higher education does not manage to offset negative demographic trends at home by attracting foreign students, which also indicates that there has been no improvement in the quality of education.
- **The number of Bulgarian students abroad is about 10 % of the students studying in Bulgaria.** As the data of the second edition of the Global Talent Competitiveness Index 2014 show, among 93 surveyed countries Bulgaria holds the 89th place by "brain drain" and the unenviable 88th place by "brain gain".
- Among the 61 countries in the World Talent Report 2015 of the Institute of Management Development in Switzerland Bulgaria holds the last place and has regressed from the result in the preceding year, including in the indicators investment and development – 54th place; appeal – 60th place; readiness – 60th place.
- Bulgaria and the other Central and East European countries continue to be net donors of highly qualified human resources because of the difference in the remuneration rates applied in the EU for researchers participating in European research projects. A qualified researcher can significantly increase his or her rate in a project by registering, for example, in an Austrian university than in a Bulgarian one. The continued discrimination of Bulgarian and East European talent in the EU undermines the convergence policies of the Union.
- **Low educational quality makes for limited human resources in software outsourcing** (software engineers/programmers) **and customer service centres** (good language skills), both of which enhance the competitiveness of the national economy. Poor teaching of mathematics and IT is likely to continue being an obstacle (given, for example, the teaching of software coding in preschool education in China).

Education is among the national priorities only in government documents and in political speeches. It is obvious that the artificial (not governed by market rationale and not reflecting the changes in society) inflation of the sector (unjustified number of higher education institutions, growing number of academic staff) does not lead to qualitative changes such as more patents and research publications, and participation in EU research projects. Thus, universities in Bulgaria are little different from secondary schools, mainly having knowledge transfer functions within the learning process and failing to participate in the creation of new research-based knowledge.

It can be expected that more sectors will share the experience of **ICT services, machine manufacturing and other fields which face serious growth barriers not in terms of demand, quality, or productivity but in terms of human potential**. Reversing this trend would require serious political commitment.

INTRODUCTION

The annual report ***Innovation.bg*** **provides assessment of the innovation potential of the Bulgarian economy** and of the status and potential for growth of the Bulgarian innovation system. It makes recommendations for improving the public innovation policies in Bulgaria and in the EU, building on the most recent theoretical and empirical studies in the world and taking into account the specific economic, political, cultural and institutional framework in which the country's innovation system operates. Over the past 10 years, *Innovation.bg* has made a number of specific proposals for improving the country's innovation policy and practice, which have been supported by business and academia. The lack of specific and sustainable actions by Bulgarian governments on the proposals made – despite their commitment to the process at the highest political level – reveals a **serious institutional deficit in the development and application of policies in the field.**

Innovation.bg 2015 analyses the status and potential for growth of the national innovation system based on five groups of indicators:

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

A highlight in *Innovation.bg 2015* is the analysis of the management of innovation-related activities applied by Bulgarian innovation enterprises. Innovation is a creative process and its successful launch entails many risks. Nevertheless, most of the activities for generation, development and implementation of new ideas can be fostered, guided and assessed so as to facilitate the innovation process and enhance its positive impact on the performance and market positions of a company.

Innovation Policy of the European Union and Bulgaria

European policy priorities in research and innovation

The European financing of research and innovation in the period 2014 – 2020 is allocated among several interrelated programmes, including:

- the framework programme **Horizon 2020** entirely aimed at activities in the field of research and innovation, and covering priority research areas;
- **sectoral research programmes,** such as on nuclear power (Euratom Research and Training Programme, International Thermonuclear Experimental Reactor), coal and steel, and space (Copernicus, Galileo);
- **European structural and investment funds** operating at the regional level, which also support research and development of innovation capacity at the local level in member states.

These programmes cover a total budget for R&D and innovation of about EUR 120 billion for 7 years. They are complemented by another **five programmes,** which do not finance directly research and innovation, but have a significant impact on them, such as COSME, Erasmus+, the Health programme, the Life programme and the Connecting Europe Facility.

As pointed out in a series of analyses and communications from the EC,[1] **increasing budgets for R&D and innovation require more efficient management,** especially given the new and more serious challenges to the Union. The opportunities for enhancing the quality of public support for research and innovation are defined in the following areas:

- Development of strategies and creation of policies: **a strategic document is needed, which should integrate the impacts in the field of research, technologies, innovation, academic infrastructure. Such a document**

[1] Research and innovation as sources of renewed growth, Brussels, 20.6.2014, COM(2014) 339 final, https://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2013/research-and-innovation-as-sources-of-renewed-growth-com-2014-339-final.pdf

should be initiated at the highest political level and should be linked to a medium-term budget framework. This is a recommendation that has been repeated many times in *Innovation.bg* reports.

- Improving the quality of programmes, channelling resources and mechanisms for financing. The **allocation of public resources should be based on transparent procedures and on a competitive and performance-oriented principle**.
- Enhancing the capacity of public institutions dealing with research and innovation should involve **supporting their transformation into autonomous organisations, operating mainly on the principle of project-oriented financing, open to internal and external entrepreneurship, attractive to leading scientists and foreign investors.**

In this regard, some of the specific tools for creating an innovation enabling environment include:

Unitary Patent, which, unlike the European Patent, offers a more simplified procedure for protection of innovations on the European market. Following a long period of deliberations (the process started in 1973), **in 2015 the last legal impediments for its creation were removed.** In September 2015, Italy became the latest country to ratify the agreement on the establishment of the Unified Patent Court and adopted the European regulation in this field. Although Spain and Croatia have not done it yet, there are no legal impediments for the unitary patent to be effective on the territory of the other 26 member states.

Venture capital passport under the heading "European venture capital funds".[2] Consultations on the adoption of a Regulation[3] on European venture capital funds, which would provide for the setting up of a pan-European legal arrangement for the use of a **single passport** in order to support European venture capital funds in attracting international investors and facilitate access to funding for innovation SMEs started in 2011. **On 30 September 2015 the Commission adopted an Action Plan,[4] including 20 key measures for building a Capital Markets Union** (Action Plan on Building a Capital Markets Union).

Public-public partnerships (PuP), in addition to the concept of public-private partnerships (P3s or PPPs): partnerships between public institutions, usually from different regions or countries in the context of large international projects. The first examples date back to the 1980s. Within the programming period 2014 – 2020, they are explicitly defined as one of the tools to be relied on for the so-called joint programming. **The eighth framework programme Horizon 2020 will invest about EUR 100 million in support of joint activities between member and associated states of the EU, including research and building of joint structures**.[5] The Joint Programming Initiatives (JPIs) have been applied since 2008 and represent a structured, strategically oriented process in the framework

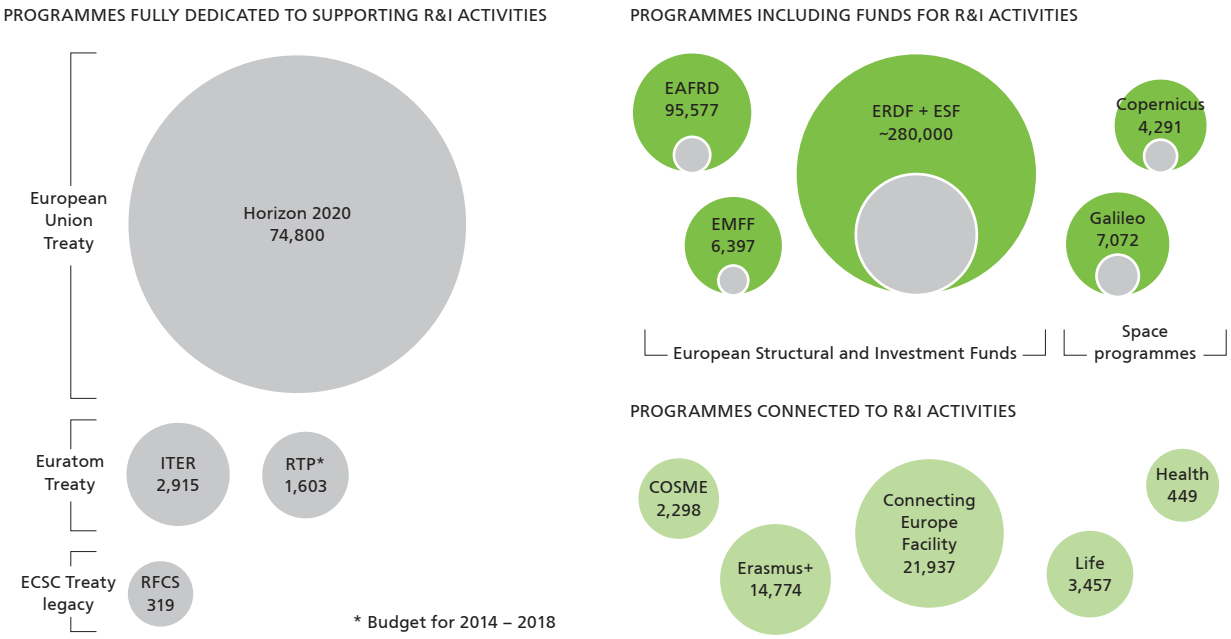
[2] A European venture capital fund has three main requirements: 1. Investing 70 % of the raised capital in SMEs; 2. Investing in own or hybrid funds of SMEs (i.e. provides "fresh capital"); 3. No use of leverage (i.e. the fund does not invest more capital than it has and therefore it has no debt), http://ec.europa.eu/finance/investment/venture_capital/index_en.htm

[3] The Regulation sets out uniform rules for investor categories, uniform requirements for mangers of collective investment companies which operate under the designation "European venture capital fund", requirements for investment portfolios, investment techniques and potential target enterprises for eligible venture capital funds. The initiative is in response to the objectives of Europe 2020 and the Single Market Act and aims to ensure that as of 2012 the venture capital funds established in any member state will be able to invest freely in the EU and to finance European innovation enterprises and create sustainable jobs.

[4] http://ec.europa.eu/finance/capital-markets-union/docs/building-cmu-action-plan_en.pdf

[5] Horizon 2020, Public-Public Partnerships and the link to ERA, https://ec.europa.eu/research/era/pdf/cofund-2014-infoday/1_p2p_horizon_2020.pdf

Figure 1. OVERVIEW OF EU PROGRAMMES FUNDING OR CONNECTED TO R&I ACTIVITIES AND THEIR RESPECTIVE BUDGETS (IN EUR MILLION)



Source: Overview of EU Funds for research and innovation, European Parliament Briefing, September 2015.

of which member states voluntarily and in partnership create a shared vision and agenda in the field of research. There are now **ten Joint Programming Initiatives** in various priority areas,[6] each of them having its own management structure. The main challenge in this programming period is the efficient implementation of the strategic objectives of the individual Initiatives and allocation of funds at national and European levels. Individual Initiatives include 13 to 27 countries. **Bulgaria is only an observer to one of them (Cultural heritage and global change) without being a member**.[7]

"Science 2.0": **a new approach to science** continues the traditional approach (known as "Science 1.0", in which research teams work individually and the results are published only on paper) **where, in combination with the technological capacity of Web 2.0, the research process, database, the verification of hypotheses and the achieved results leave laboratories to be shared through different open access platforms.** It is precisely open access (open access to publications and to data) that is seen as a key – but not the only – element of the "Science 2.0" concept.[8] Debates in Europe about the need for research to change its nature, like many other areas under the spread of internet and modern technologies, started in 2008. In the period 2014 – 2020, the main objectives to be achieved through the eighth framework programme Horizon 2020 are several: raise awareness of the process of science transformation and the potential results for individual stakeholders; identify expectations about the opportunities and challenges; prepare the necessary policy framework which would enable the transformation and make it acceptable to research communities.

[6] http://era.gv.at/directory/62

[7] Moreover, the phrase "public-public partnership" in Bulgarian does not appear in the Google search engine.

[8] Public Consultation "Science 2.0": Science in transition, Background document, EC, DG Research&Innovation (RTD) and Communications Networks, Content and Technology (CONNECT), https://ec.europa.eu/research/consultations/science-2.0/background.pdf

The same idea – although developed not centrally but entirely spontaneously – is contained in the concept of the **sharing economy** (also referred to as collaborative consumption and peer-to-peer [P2P] economy)[9]: a model of sharing time, space, tangible and intangible assets, skills, money, and an alternative scheme to **"reduce, reuse, recycle, repair"** so-called waste. The lack of regulation in this field allows for the fast spread of shared use, on the one hand, but on the other hand is used by supporters of the traditional business model to try to preserve their markets (an example is Uber in Europe).

The innovation policy of Bulgaria in the EU

It is obvious that at the European level research and innovation provide a major input to economic growth and improved competitiveness of the European and national economies. Countries which intend to reposition themselves not only in the framework of the European Research Area, but also on the European and international markets need to have a stronger commitment to innovation at the political level.

The main messages of the European Commission to Bulgaria are as follows: **the country needs to invest more funds in R&D** (the changed approach of legislators towards public spending for R&D is reflected in considering such expenditure as investment in the framework of the European system of national and regional accounts – SEC 2010); **external sources should complement not substitute** internal (public and private) resources; investment in R&D, combined with **a reform of the research and innovation system; combining financial with tax stimuli** for innovation activity; monitoring and **evaluation of the efficiency and impact of the measures taken** on the results from the functioning of the innovation ecosystem.

Following the approval by the European Commission of the documents that will guide developments in the fields of science, technologies, innovation and education in Bulgaria, 2015 was the first year of the 2014 – 2020 programming period in which practical work started on the procedures for awarding grants:

- **Innovation Strategy for Smart Specialisation** – the government adopted the final version of the document only on 28.10.2015;
- Operational Programme **"Science and Education for Smart Growth"** – on 20.02.2015;
- Operational Programme **"Innovation and Competitiveness"** – on 16.03.2015;
- Operational Programme **"Initiative for Small and Medium Enterprises"** – on 13.10.2015.

The main goal of these documents is to enhance Bulgaria's competitiveness on the European and international scene and the country's shift from the group of modest innovators to the category of moderate ones. The objectives are ambitious:

- **increasing R&D financing in order to reach the target of 1.5 % of GDP by 2020** by launching the entirely new Operational Programme "Science and Education for Smart Growth"; revitalise the instruments for financial engineering and promote entrepreneurship;

[9] http://thesamewavelength.com/the-century-of-the-generals-and-sustainability/

- **reducing regional imbalances** through regional research centres, and through the three potential funds under the JESSICA programme;
- **ensuring a link between science and business** through the centres of competence and regional research centres; projects for student internships and apprenticeships, support of dual education, participation of the business in updating of the curricula and delivery of practical training at vocational high schools;
- **human resource development** through the priority axis "Education and Lifelong Learning" of OP „Science and Education for Smart Growth" and the funds envisaged for OP „Human Resources Development" for entrepreneurship;
- **development of research infrastructure** through the centres of excellence, centres of competence and modernisation of the research infrastructure;
- **development of networks and the infrastructure of intermediaries** by supporting cluster development and Sofia Tech Park.

Despite the strategies, the financial backing and simplified procedures (including electronic submission of documents) under the operational programmes, the 2014 – 2020 objectives are jeopardised by the accumulated serious problems as identified in the latest assessments of the innovation system and some of its units.[10] This is exacerbated by the fact that these documents were not driven by some national agenda but were required by the EC as precondition for receiving financial aid. The policy and administrative capacity for innovation remains very limited at the national level, and non-existent at the regional and local levels.

In Bulgaria, the units identified by innovation theory as elements of an ecosystem, along with the links among them (to the extent that they exist), are not managed within a consistent framework based on in-depth analysis of the potential and the need for innovation, the causal links in the innovation life-cycle, the place and role of individual units in the innovation ecosystem, the synergy effects among them and the opportunities for their growth. Thus, the **management of innovation processes remains outside the priorities of the policy cycle.** Imbalances deteriorating further as a result of political shortsightedness can be found in various places: between fundamental and applied research; antagonism between institutions (BAS and AA; research and business-oriented higher schools); regional imbalances.

In order to provide opportunities for improvement, attention should be focused on several **main recommendations**:

1) **Management of the innovation ecosystem**
   - **Improving R&D reporting.** Investments of Bulgarian enterprises – in terms of costs and staff – in research and innovation are still underestimated for various reasons: lack of formal definition/label of innovation enterprise, as well as a register of innovation enterprises; lack of sufficient incentives and the knowledge and capacity to apply them when innovations are implemented; lack of knowledge and experience in R&D reporting or underestimating the importance of the information submitted to the NSI.

[10] Peer Review of the Bulgarian Research and Innovation system, Horizon 2020 Policy Support Facility, DG RTD – H2020 Policy Support Facility, September 2015; AUDIT REPORT No. 0700010614 on conducted audit, Implementation of the National Research Strategy for the period from 01.08.2011 to 31.12.201, July 2015, http://www.bulnao.government.bg/bg/articles/fond-nauchni-izsledvaniq-ne-e-upravlqvan-efektivno-v-polza-na-ikonomikata-ustanovi-odit-na-smetnata-palata-1493

- **Creating joint registers** of ministries and institutions (including PORB and NSI) in order to ensure open access to the whole group of indicators which measure entry and exit from the research, development and innovation system at high level of detail. This would enhance the transparency of the system in terms of results oriented investment of financial and human resources and would allow the use of information which currently is not taken into account when designing policies in this field.
- **Establishing a single body (ministry, agency) in charge of government policy on science, technology, and innovation.** This body would adopt measures for the development of the innovation ecosystem, and will thus be the locus of responsibility in this area.

2) **Balancing the development of the innovation ecosystem in terms of individual institutions and the forms of interaction in which they participate** would entail:
   - **Creating a robust infrastructure of intermediaries**. After the first programming period of the country's membership in the EU, there are only a handful of innovation incubators and entrepreneurship centres which remain active after project completion, and the existing ones perform a very small number of the functions for which they were created.
   - **Building on-line platforms for transfer of new and advanced technological products.**
   - **Implementing an accreditation system of clusters in Bulgaria.**

After the first completed programming period for Bulgaria as a full member of the EU and more than ten years of experience of promoting the development of cluster practices in the country, the following conclusions can be made: 1) Financial support of the clusters still does not reflect the importance of natural factors of attraction, traditions and trust in their creation, which results in the phenomenon "absorption of European structural financing", rather than support for processes based on business rationale (adding value and protection of mutual interests); (see further the section "Entrepreneurship and Innovation Networks"). 2) The availability of clusters which have successfully left the embryonic phase of their life cycle and continue to develop to maturity is not matched by the corresponding administrative capacity, which led to tensions in the latest procedures for allocating public financing. 3) The only organisation in the country which represents a large number of the actually operating business clusters and protects their interest became an active and constructive partner of the public administration. The result is the accreditation system of business clusters in Bulgaria developed by the Association of Business Clusters.

3) **The growing regional imbalances in the innovation potential of the regional innovation systems need to be addressed.** This also applies to the use and development of this potential and entails:
   - **delegating specific functions and budgets to the regional and municipal level** in order to apply the principles of the innovation strategy for smart specialisation through the development of the regional innovation systems;
   - **creating a differentiated business environment in the regions** to support entrepreneurship in small towns and villages;
   - **allocation of public financing for research and innovation by region**, including in small towns. The allocation should be based on the principle of closer interaction among units of the innovation system situ-

Box 1. THE CONCEPT OF THE ASSOCIATION OF BUSINESS CLUSTERS FOR AN ACCREDITATION SYSTEM OF BUSINESS CLUSTERS IN BULGARIA

The suggested system of accreditation of clusters in Bulgaria is based on and reflects the accreditation/labelling of clusters[11] established in Europe, which implements the policy of the EC in the field of innovation and competitiveness for promotion and development of competitive clusters on a global scale (the so-called world-class clusters).

The main purpose of the System for Clusters Accreditation in Bulgaria is to support the implementation of the government policy on business cluster development. The accreditation system also seeks to provide the managing authority with feedback in assessing the results of the applied measures as well as assessing the professional development and strengthening of the administrative capacity of business clusters in Bulgaria.

The implementation of the system would help create models tailored to the specific needs of cluster organisations. The assessment of clusters will consider the availability of internal interaction and the degree of cluster development, taking into account a number of factors and parameters in the following areas:

- Inspection of administrative compliance, which should assess the structure, the field of activity and the objectives of the cluster, as well as its compliance with the policy and objectives of the programme.
- The availability of clear and specific definition of common objectives and interests, focused on enhancing the competitiveness of the members and the cluster as a whole.
- Strategic planning – defining a common strategy and plan for implementation through joint activities and cooperation based on consensus among the members.
- Available facilities and processes for team work (business cooperation among cluster members, complementarity among cluster members, cooperation with R&D institutions and NGOs).
- Actual results from the operation of the cluster organisation, measurable through the growth of financial and/or other economic indicators of members.
- Availability of a cluster brand. Successful communication among cluster members and with customers, creating new market niches.

The accreditation system provides for the differentiation of clusters in three main categories depending on their degree of development. These categories determine the share of funds in the total financial measure for clusters under OP Innovation and Competitiveness, and the allocation of funds for the support and development of relevant categories of clusters.

Source: Association of Business Clusters, 2015.

ated in different geographical parts of the country (as applied in the EU cohesion policy);

- provision of **public financing for the development of technological value chains and related productions**, offering an integrated product on the market and engaging companies from different economic sectors situated in different parts of the country;
- **separating Sofia City as an individual planning region** in order to avoid the standardised thresholds for co-financing by beneficiaries within the SWPR, which places the regions outside Sofia City in a disadvantaged position.[12]

[11] http://www.cluster-analysis.org

[12] In the new OP Innovation and Competitiveness the amount of aid will be determined on the basis a new "regional" principle, defined in accordance with the European Union regional aid map for the period 2014 – 2020. Under the new rules, companies from the SWPR will receive smaller amounts from the programme and the thresholds are 25 % aid for large companies with an option for an increase of up to 35 % for medium enterprises and up to 45 % for micro and small enterprises. The reason for this change is that SWPR covers Sofia and economic data for the capital distorts the performance data of the entire region. The region includes the regions of Blagoevgrad, Kyustendil, Pernik, Sofia region and the city of Sofia. The conditions remain unchanged for the other 5 planning regions – a 50 % grant for large companies and option for an additional 10 % increase for medium companies (up to 60 %) and 20 % increase for micro and small enterprises (up to 70 %).

4) **At the point of inputs – significant increase of financing for R&D and investment in human capital,** including:
   - **clearly defined government commitment (medium-term budget forecast),** particularly for specific competitive programmes and measures (initiatives of the NIF and the Ministry of the Economy);
   - **linking different sources of financing** according to the stage of the innovation life cycle;
   - **ensuring co-financing** for the participation of Bulgarian companies, NGOs and research organisations in EU research and innovation programmes;
   - **introducing – in a suitable way – entrepreneurship education** in all stages of education; promoting organised creativity in primary, secondary and higher education;
   - **promoting the adoption of creative learning methods**, oriented towards detecting and developing the potential of every child, and enhancing the motivation and commitment of teachers applying them;
   - **involving business** in the development of curricula and delivery of practical training. Where such practices exist they are initiated by business (e.g. the Software University, the academies of large software companies in the country, A Data Pro and their joint programme with Veliko Tarnovo University; the programme of Overgas for vocational and dual training, etc.);
   - **in-depth analysis of students continuing their education abroad.** This is the most important segment of the national human capital that is capable of developing the country's innovation potential in the future. Analysis should be done by country and university, by science field and academic degree, so as to find ways for retaining them or integrating these students after the completion of their education. Although the problem with this form of brain drain is constantly worsening, there is no reliable data on its scope.

5) **At the point of outputs – transparent procedures should be applied to the analysis and assessment of the results achieved and reporting on the amount and effectiveness of the resources spent.** Although the application of such procedures is envisaged in each of the programme documents, in practice they are not strictly and consistently applied, which is evidenced by the numerous administrative impediments and abuse of public resources in this field.

Box 2. AGRICULTURAL ACADEMY – A MAJOR PLAYER ON THE INNOVATION SCENE IN BULGARIA

The Agricultural Academy (AA) carries out fundamental and applied research, and support activities in the field of agriculture, breeding and food industry. The AA has 48 units, including 25 research institutes, 22 experimental centres and the National Museum of Agriculture. The Agricultural Academy is the only research institution in the country authorised by the Agricultural Academy Act and other by-laws to carry out research in the field of agriculture, animal breeding and food industry and create products which are subject to intellectual property protection.

Decentralisation of AA research in 25 regional units allows research to be conducted nationwide. The applied nature of the research projects and service activities bring research results as close as possible to the problems of agricultural farms. The AA owns over 2/3 of the protected technological knowledge in the county in the field of agricultural sciences.

Nevertheless, when **setting scientific priorities and innovation guidelines and when developing the main legislative and strategic framework in the country for promoting science and technologies the role of the Academy is underestimated.** This is true both in terms of the Promotion of Research Act and the Innovation Strategy for Smart Specialisation

Box 2. AGRICULTURAL ACADEMY – A MAJOR PLAYER ON THE INNOVATION SCENE IN BULGARIA (CONTINUED)

of the Republic of Bulgaria 2014 – 2020. **Neglecting the role of AA as an important representative of the Bulgarian science** results in the deterioration of the problems it faces.

Lost interest in old plant varieties, the penetration of new highly productive varieties (Bulgarian and foreign) and the failure of some institutes to pay their annual fees lead to discontinuation of certificates of plant varieties and animal breeds, and other objects of intellectual property at the Patent Office. As a result, the total number of protected products in 2014 remained relatively stable – 379 maintained certificates. Of these, the highest is the share of cereals – 142; cereal-bean crops – 14; oil and industrial crops – 52; forage – 27; vegetables – 48; tobacco – 26; vines – 22; orchard crops – 22; animal breeds – 14, and flowers (blossoming and leaves-decorative) – 19.

Over the last 20 years and particularly after Bulgaria's accession to the EU the regime of recognition of varieties/hybrids resulting from foreign selection has been substantially simplified. Powerful selection companies have financial resources not only for selection and research but also for development and distribution. The financial resources available to the institutes of the Agricultural Academy do not allow them to compete in terms of advertisement and the dissemination of the new varieties/hybrids.

Source: Annual Report, AA, 2015.

Innovation Potential of the Bulgarian Economy

Gross Innovation Product

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

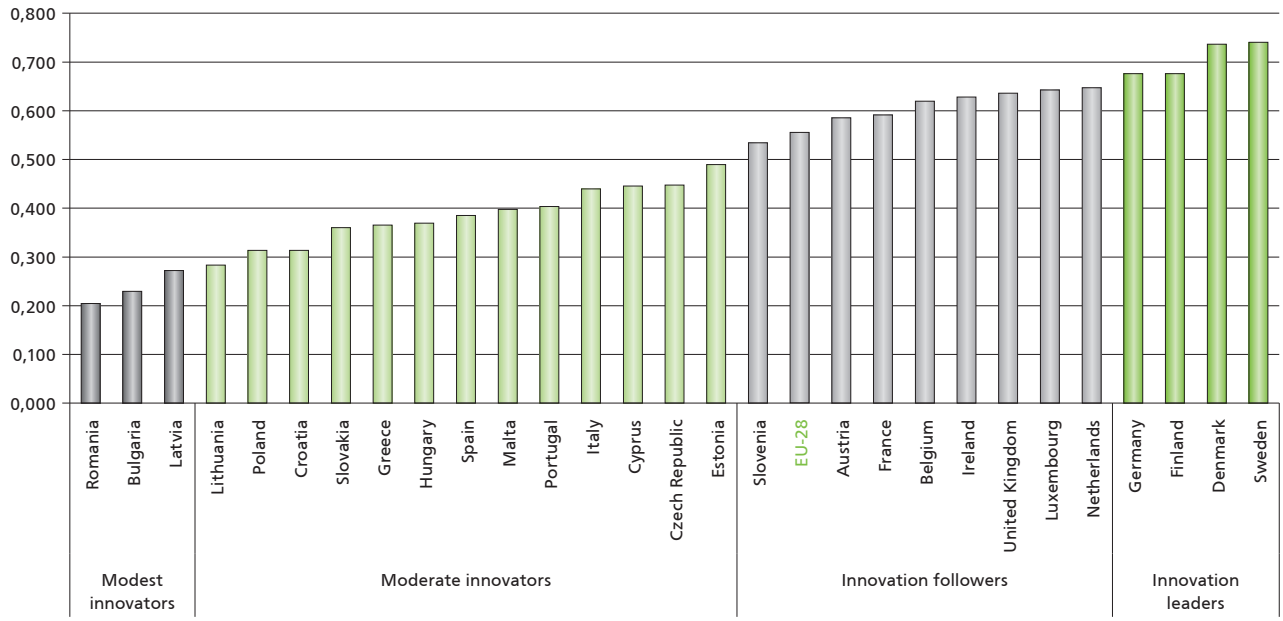
Innovation Product

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

The results of the **Innovation Union Scoreboard 2015**[13] indicate that the innovation leaders of Europe owe their rankings to a series of measures. Some countries maintain their position as leaders and hold strong positions in all the other groups of indicators. The characteristics measured by these indicators are interrelated and reinforce each other's effect on the innovation potential of the economy – favourable business environment supported by joint efforts of both private and public sectors in the form of financing and human resources, which in turn leads to scientific excellence, technological breakthroughs and innovation products, processes and business models.

In the group of moderate innovators (lagging behind by over 50 % from the average EU-28 level), **Bulgaria is close to Latvia and Romania.** With the exception of the indicators for human resources, intellectual property and, to some extent, business investments, in which Bulgaria is close to the average European levels, it is trailing considerably in the other categories. This concerns primarily public

Figure 2. INNOVATION UNION SCOREBOARD 2015



Source: Innovation Union Scoreboard, 2015.

[13] Innovation Union Scoreboard 2015, http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en.pdf; http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm. The data used are updated as of 2013, including by individual indicator.

financing and interaction in the field of research and innovation as factors for promoting innovation behaviour, on the one hand, and the results from innovation activity at company level (technological, marketing and organisation innovations) and at national level (employment and exports from knowledge-intensive economic sectors, participation technological transfers), on the other hand.

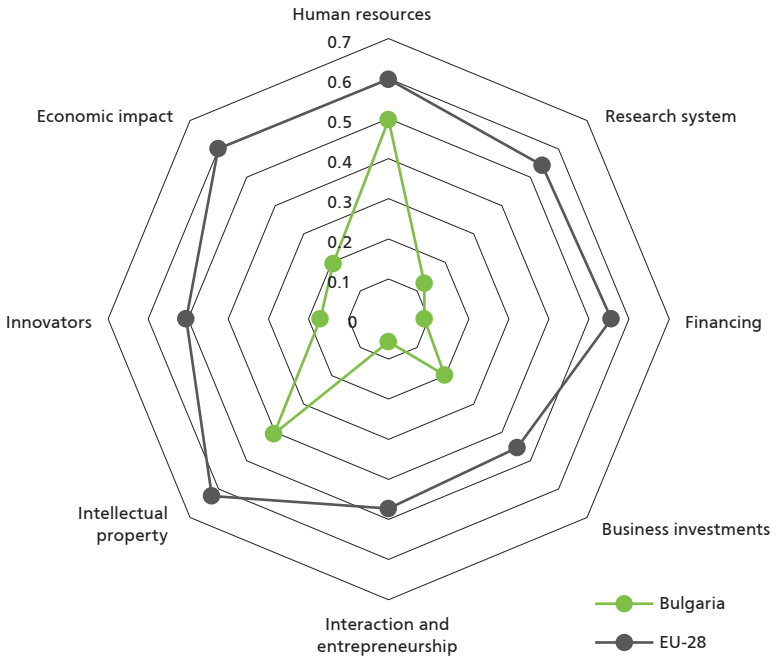
The factors most significantly supporting the innovation performance of the country and in respect of which there is most tangible improvement include registered applications for protection of industrial design and trademarks in the Community (year-on-year increase by 60.8 % and 28.5 % respectively); business spending on R&D (18.8 %); public-private academic publications disseminating results from joint research projects (14.4 %) and the number of doctoral degree graduates (10.4 %).

In contrast, there was a significant decline in investment in venture capital (-28 % over the period 2008 – 2013) and public expenditure for R&D (a 3.9 % year-on-year decline). A fall by 12 % occurred in the sales of products new for the market and the company (according to data from Community Innovation Survey 2010 and 2012).

The findings of the **Global Innovation Index 2015**[14] confirm that sustained innovation is the only possible approach to maintaining high economic competitiveness. The indisputable leader in the 2015 ranking is Switzerland with an index of 68.30. **Bulgaria ranks 39th with index 42.16 – 24th position within EU-28,** ahead of Croatia, Greece, Poland and Romania but a **decline from the 2014 position of index 40.7.**

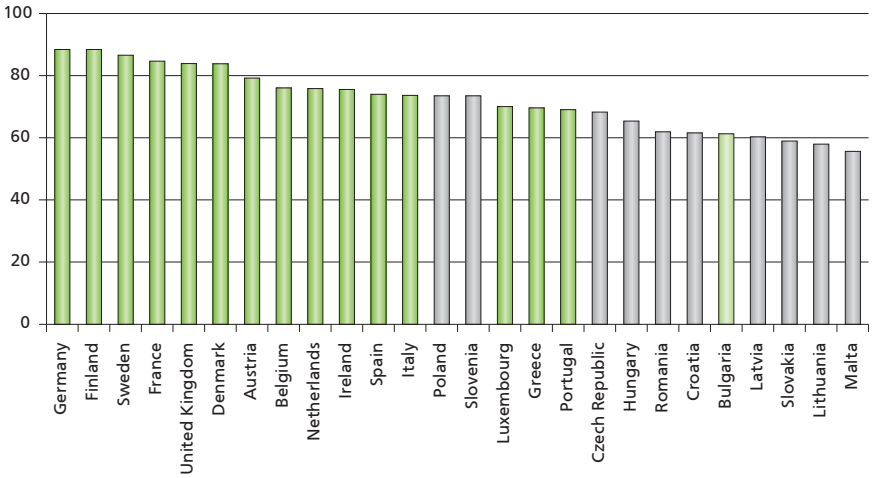
Some of the areas in which Bulgaria has relatively good results are certifications (standard business practice); R&D investment from other countries (the main resources on which Bulgaria relies); applications for utility models and trademarks; registration of new business. **The main weaknesses are associated with spending on education, e-government, business spending on R&D, cooperation between science and business, development of clusters; commercialisation based on new knowledge** (royalties, import of high-tech products, FDI). These are all areas in need of serious policy intervention and a combination of

Figure 3. INNOVATION UNION SCOREBOARD 2015: BULGARIA COMPARED TO EU-28



Source: Innovation Union Scoreboard, 2015.

Figure 4. RANKING OF THE MOST INNOVATIVE COUNTRIES IN THE WORLD



Source: Bloomberg Most Innovative Countries, 2015.

[14] https://www.globalinnovationindex.org/content/page/GII-Home

financial and non-financial measures for which there is no still appreciation and commitment by the government.

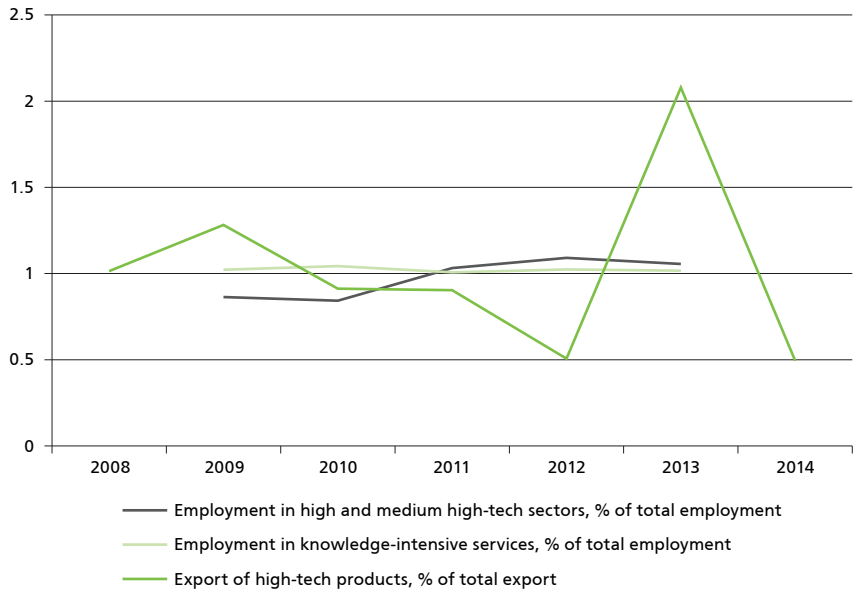
According to Bloomberg's Most Innovative Countries 2015[15] survey, which considers innovation from a business point of view, all EU-28 member states except Estonia and Cyprus are present in the Top-50. **With index 61, Bulgaria ranks 39th** ahead of Latvia, Slovakia, Lithuania and Malta.

Bulgaria had best results in the field of education (24th place, including data on enrolled students, employees with higher education and graduates in the natural sciences); **high-tech public companies** (30th place, calculated as a share in total number in the world); and **patent activity** (33rd place, total and in the utility sector, restated on the basis of the number of population and based on R&D costs). The dividing line between old and new members of the EU is clearly discernible, the former holding the first places and the latter positioned in the lower half of the ranking.

Some of the components of the success formula as recommended in the ranking of Bloomberg include:

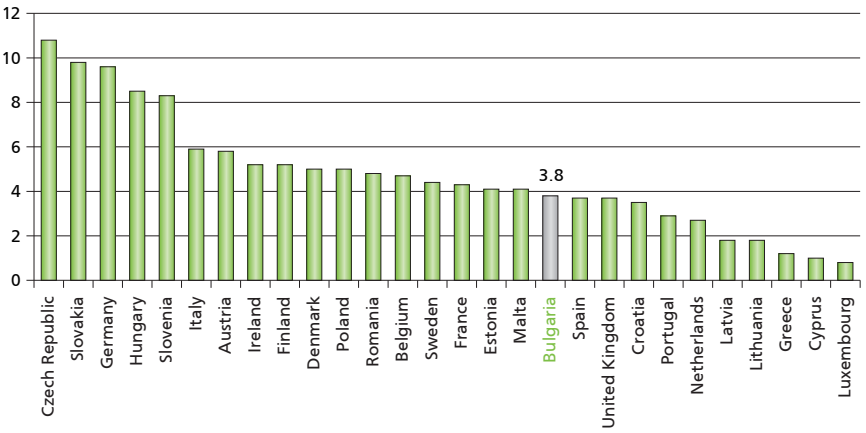
- **Research has weak or no potential if it remains in laboratories**. In many countries the scientists engaged in leading governmental centres have no incentives to promote the practical application of their results. In these cases it is the society that pays the cost but benefits nothing.
- **The overall level of education in a country and university qualifications** (relatively strong positions for Bulgaria) **contribute to high innovation activity, but the link is not direct and automatic.** In an environment of corruption and red tape (also typical of Bulgaria) well educated young people have difficulties pursuing their careers.

Figure 5. DEVELOPMENT OF THE HIGH-TECH SECTOR IN BULGARIA, ANNUAL INDEX OF CHANGE



Source: Eurostat, 2015.

Figure 6. EMPLOYMENT IN HIGH-TECH AND MEDIUM HIGH-TECH SECTORS, % OF TOTAL EMPLOYMENT, 2013



Source: Eurostat, 2015.

- **R&D staff concentrated in niche and knowledge-intensive sectors are a key factor for innovation, particularly in small and open economies with limited national demand.** This is the case with the countries leading the ranking by this indicator – Finland (leading in gamification, see Angry Birds, especially after the latest transformation of Nokia), Iceland (leader in genomics), Denmark (pharmaceuticals), Israel (software) and Singapore (electronics).

Given the lack of sustainable innovation policy, there are ample opportunities for applying in Bulgaria the good practices and the lessons

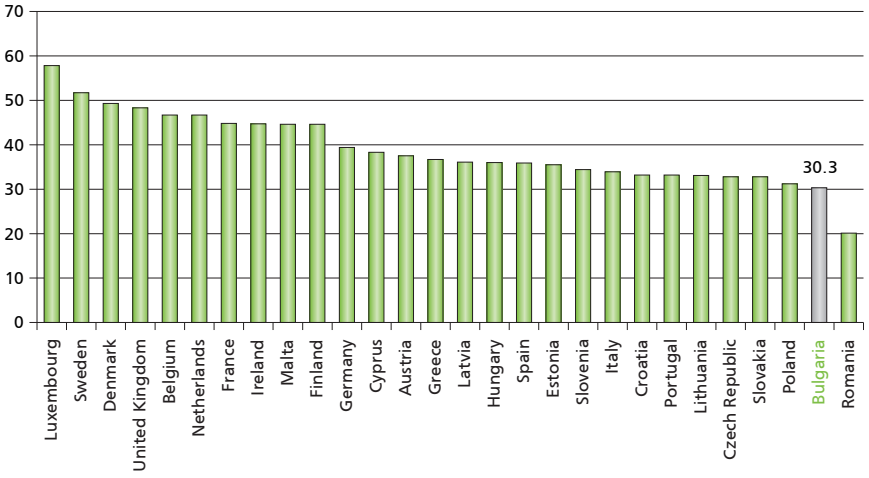
[15] http://www.bloomberg.com/visual-data/best-and-worst//most-innovative-countries

learned from the experience of countries which are innovation leaders. This is supported by the data on the development of high-tech industries in the country.

In the period 2008 – 2014 indicators on employment in high-tech and medium high-tech industries,[16] **science-intensive services**[17] **and on the export of high-tech products varied considerably**. The variations have been very pronounced in the export of high-tech products, and less so in employment in high-tech and medium high-tech activities. In respect of the two indicators, despite the periods of rapid growth, the pre-crisis 2008 levels have not been reached, accounting for 7 % of the total export of the country in the first case and 4.4 % of total employment in the second case. **A trend of gradual increase is present in employment in science-intensive services,** which was at 27.1 % of total employment in 2008, and reached 30.3 % at the end of 2013. Despite the increase, however, by this indicator Bulgaria ranks at the last but one place within EU-28, ahead of only Romania.

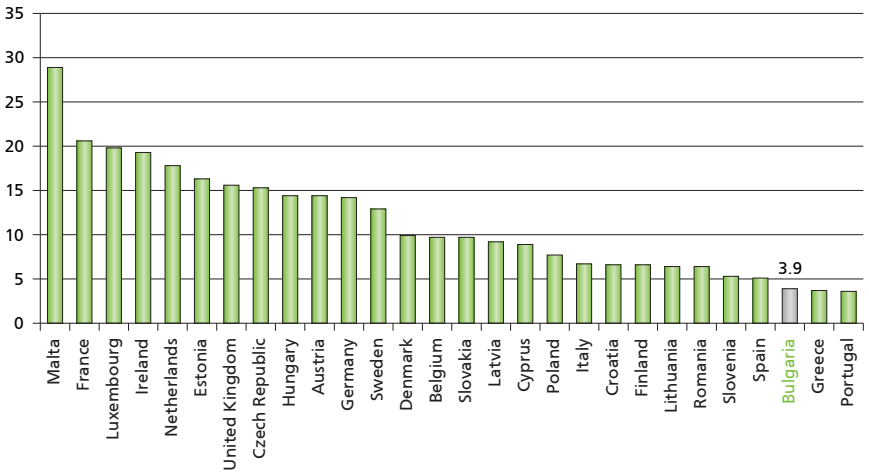
In the European countries, there is no strong correlation between employment in high-tech and medium high-tech industries and the export of high-tech products. Even countries like the Czech Republic, Slovakia and Germany, which hold the top places in terms of employed in the field of high technologies, report average levels of export of high-tech products. Likewise Bulgaria, which is in the middle of the ranking of employed in high-tech activities, does better than only Greece and Portugal in terms of the share of high value added products in its exports. Other countries like Malta, France and Luxembourg retain their leading positions, in export of high-tech products, without being leaders in the level of employment in the relevant industries.

Figure 7. EMPLOYMENT IN KNOWLEDGE-INTENSIVE SERVICES, % OF TOTAL EMPLOYMENT



Source: Eurostat, 2015.

Figure 8. EXPORT OF HIGH-TECH PRODUCTS, % OF TOTAL EXPORT



Source: Eurostat, 2015.

[16] High-tech sectors include manufacture of: medicinal chemicals and products (NACE 24.4); office machinery and computers (30); radio, television and communication equipment and apparatus (32); aircraft and spacecraft (35.3). The medium high-tech sectors include the manufacture of: chemicals (excluding medicinal chemicals and products (24); machinery, equipment and household appliances (29); electrical machinery and apparatus n.e.c. (31); medical, precision and optical instruments, watches and clocks (33); motor vehicles, trailers and semi-trailers (34); railway and tramway locomotives and rolling stock (35.2); motorcycles and bicycles (35.4); other transport equipment n.e.c. (35.5).

[17] Knowledge-intensive services include high-tech services: post and telecommunications (NACE 64); computer and related activities (72); research and development (73); market: water transport (61); supporting and auxiliary transport activities; activities of travel agencies (62); real estate activities (70); renting of machinery and equipment without operator and of personal and household goods (71); other business activities (74); financial: financial intermediation, (65); insurance (66); activities auxiliary to financial intermediation (67); other: education (80); health and social work (85); recreational, cultural and sporting activities (92).

Assessments of the capacity of Bulgarian companies to manage innovation

This analysis[18] provides a perspective on the **strengths and weaknesses of Bulgarian companies in commercialising innovation**. It is based on assessments of the capability for innovation management of Bulgarian small and medium enterprises in the database of IMP³rove – European Innovation Management Academy. Based on the A.T. Kearney House of Innovation, the data cover innovation management comprehensively, including innovation strategy, innovation organisation and culture, innovation life cycle processes, enabling factors and innovation results. The analysis indicates that there is important room for improving the effectiveness of innovation management in Bulgarian companies.

Although about 80 % of the assessed Bulgarian companies have defined an innovation strategy, the data indicate that a vision for innovation is often not clearly communicated to staff. While there is important potential in innovation strategies to focus limited funds effectively, their full effect cannot be realised if the strategy's essentials are not communicated well to employees, business partners and customers.

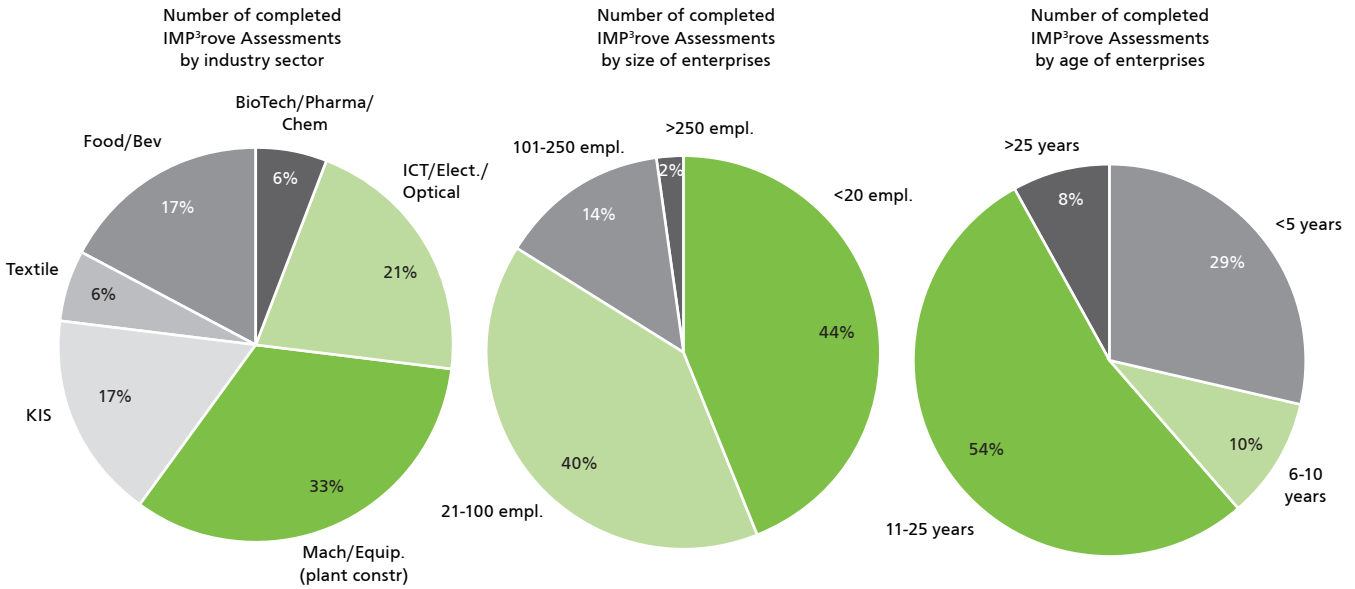
In innovation organisation and culture, Bulgarian companies show slightly lower cultural innovation readiness compared to those in the rest of the world. In terms of innovation organisation, Bulgarian companies have the potential to further intensify collaboration with innovation partners. Data on innovation life cycle processes indicate that Bulgarian SMEs are on par with companies from other countries regarding the generation of ideas, but struggle to link the existing innovation strategy to processes, potentially inhibiting strong innovation results.

In comparison with other countries, companies in the Bulgarian sample were well positioned in terms of budget allocated to long-term innovation projects. Product innovation is the traditional profit driver, with other types of innovation gaining importance over the past two years. Looking forward, the assessed companies considered the role of innovation management important today and increasingly important in the future.

Sample description

The study was based on in-depth innovation management assessments of 52 Bulgarian companies compared to a sample of 2,707 assessments of companies in other countries. The Bulgarian sample included various sectors and mostly SMEs that have up to 100 employees and are between 11 and 25 years old (see Figure 9). The sample of companies has been supported to a large extent by public and private business advisors with the aim of enhancing the SMEs' innovation management capacity.

Figure 9. Companies which have completed the IMP³rove assessment by sector, size and age



Source: IMP³rove – European Innovation Management Academy; data as of October 2015.

[18] This analysis was developed by a team of the European Innovation Management Academy (www.improve-innovation.eu) for *Innovation.bg 2015*.

Assessment results per dimension of innovation management

The following presentation of findings is based on five dimensions of innovation management, starting with innovation strategy and ending with innovation results (see Figure 10).

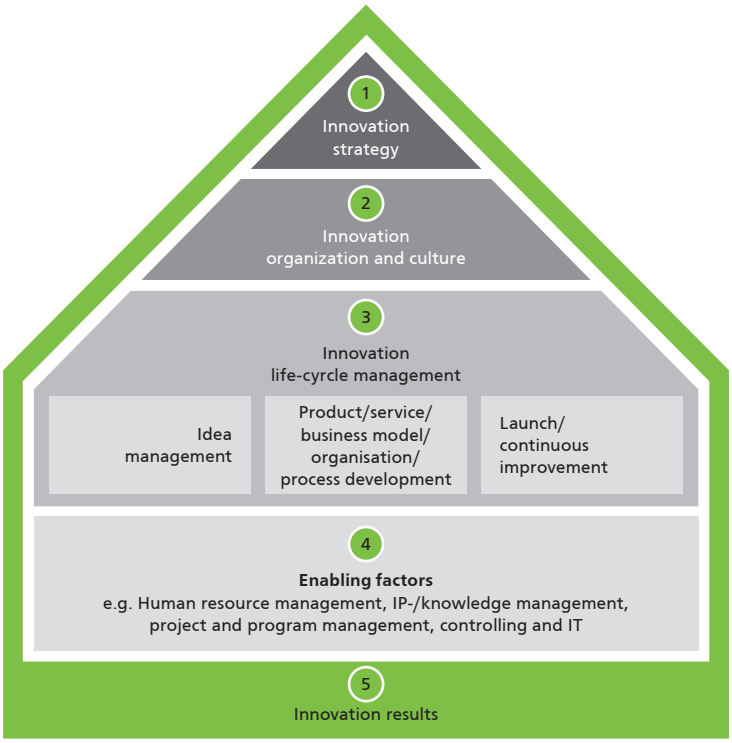
The study initially assessed the **innovation ambition** of Bulgarian companies. Overall, the innovation ambition of the assessed companies was focused on incremental innovation and on making small improvements. Nevertheless, 15 % of the Bulgarian companies in the sample indicated that they strive for radical innovation to fundamentally change the competitive environment.

A vision of innovation can inspire staff and external partners. Around two thirds of companies indicated that their vision was clearly linked to innovation. However, only a third of Bulgarian companies have documented their vision for all staff to see. While 72 % of companies stated that their vision was well understood by customers and suppliers, only 55 % indicated that the vision was well understood by innovation partners. These findings demonstrate room for improvement in terms of clearly communicating a distinct innovation vision.

As shown in Figure 11, 79 % of the assessed Bulgarian companies report that they have defined an innovation strategy. The analysis highlights different features of the innovation strategy. For about 60 % of assessed companies, innovation strategy results from an analysis of potential business areas while setting clear objectives for innovation management. More than 70 % of Bulgarian companies in the sample indicate that innovation strategy guides the development of their innovation capabilities, in particular the improvement of current products or services. However, only half use their innovation strategy to guide ideas management, set objectives for project management, and provide a crucial basis for organisational changes and business model development. This finding reveals a capability gap among the assessed Bulgarian companies in exploiting their strategy to guide important processes of the innovation life cycle.

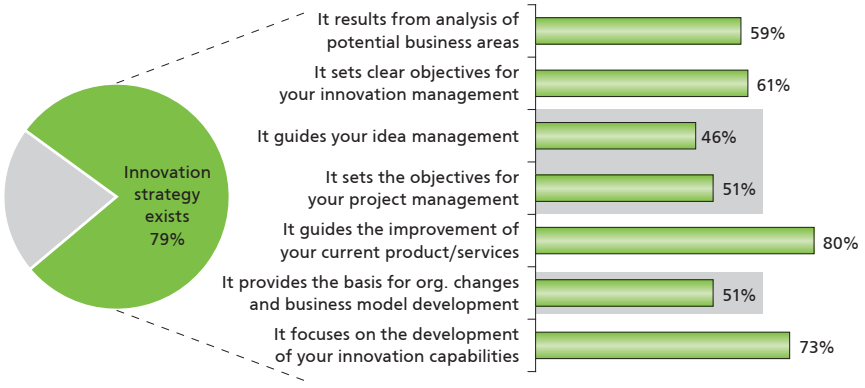
Sustainability represents an important driver for innovation. Around 70 % of companies in the sample consider economic sustainability, ecologically and socially sustainable production and manufacturing methods, and ecologically and socially sustainable application methods as drivers for innovation strategy. This shows that

Figure 10. A.T. KEARNEY HOUSE OF INNOVATION



Source: A.T. Kearney; IMP³rove – European Innovation Management Academy.

Figure 11. AVAILABILITY AND ATTRIBUTES OF AN INNOVATION STRATEGY IN THE BULGARIAN SAMPLE



Source: IMP³rove – European Innovation Management Academy; data as of October 2015.

sustainability is a driver for innovation strategy among the companies in the Bulgarian sample, but room for improvement remains.[19]

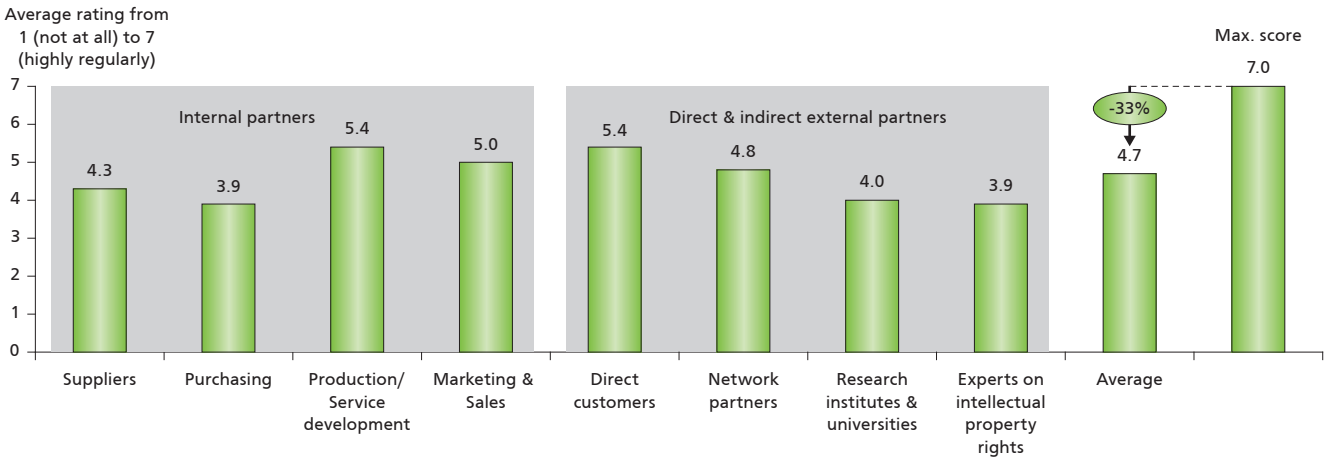
As part of the second dimension of the House of Innovation, **readiness for cultural innovation** measures the attitude of top management, middle management and employees towards innovation. Cultural innovation readiness encompasses the following components: "excited/passionate about innovation", "open rather than sceptical towards new unusual ideas", "able to think out-of-the-box", "imaginative", "able to 'sell' ideas internally" and "focusing on business impact". Bulgarian companies in the sample are slightly behind in cultural innovation readiness compared to companies in the rest of the world.[20] At the same time, analysed Bulgarian companies are more reluctant towards cultural innovation than companies in the rest of the world, which means that they are more reluctant to try out new methods.[21] This shows that there is potential for Bulgarian companies to foster innovation readiness.

In addition to strengthening internal innovation culture, the analysis shows that Bulgarian companies in the sample could strengthen their engagement of innovation partners, in particular with external partners. The extent to which companies are regularly involved with partners to generate new ideas and collect suggestions for improvements was rated from 1 (not at all) to 7 (highly regularly). With average ratings above 5, Bulgarian companies are fairly strong in engaging internal production and service development, marketing and sales functions as well as direct customers. The potential for improvement lies in strengthening the collaboration with suppliers and purchasing, on the one hand, and research institutes and universities as well as experts on intellectual property rights, on the other hand (see Figure 12).

In **innovation life cycle management** the first step is ideas management. About one out of five assessed companies in Bulgaria generates more than twenty-five ideas for incremental innovations per year, and one out of ten generates more than twenty-five ideas for radical innovation per year. Companies from the rest of the world fare slightly better in incremental innovation – one in four companies generate more than twenty-five ideas per year. For radical innovation, foreign companies are slightly behind the Bulgarian sample's results. Despite their strength in generating ideas, Bulgarian SMEs lag behind in turning reviewed ideas into projects and turning reviewed ideas into sales. The data indicates that on average, 36 % of reviewed ideas are turned into projects for the Bulgarian sample, compared to 50 % for the rest of the world. Companies from the rest of the world turn 11 % of reviewed ideas into sales; the contrasting figure for the Bulgarian sample is just 2 %. This indicates that Bulgarian companies need to better manage the entire innovation life cycle, not just the front end to generate business impact.

As seen in Figure 13, only half of Bulgarian companies assessed use interdisciplinary teams for screening/evaluation of ideas, and 42 % use them to launch ideas. Only 25 % and re-

Figure 12. REGULAR INVOLVEMENT OF PARTNERS TO GENERATE NEW IDEAS AND COLLECT SUGGESTIONS FOR IMPROVEMENTS



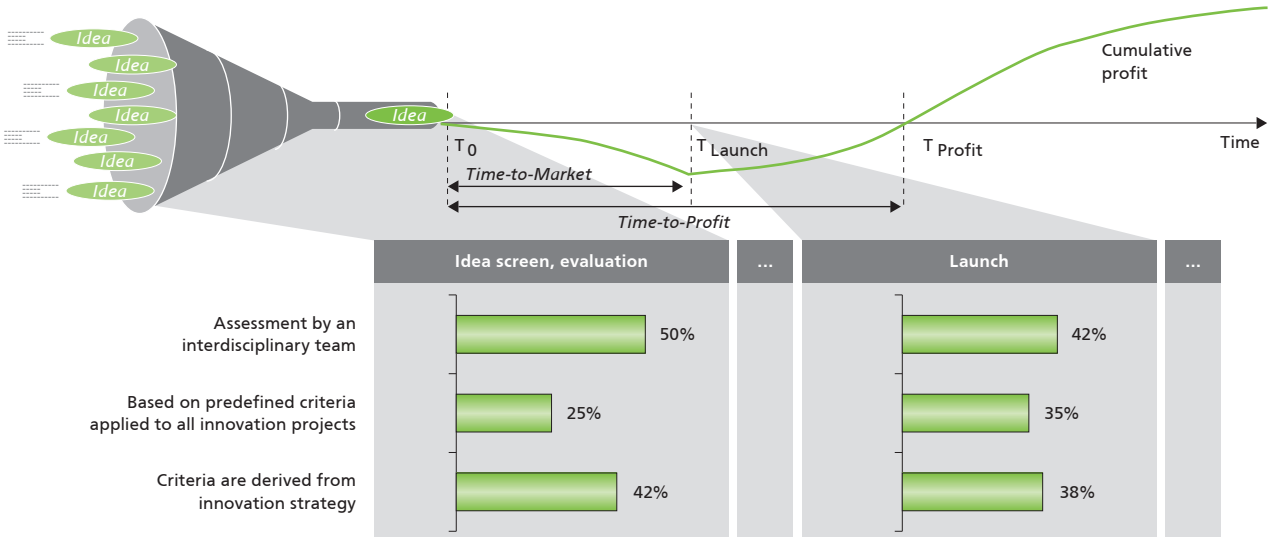
Source: IMP³rove – European Innovation Management Academy; data as of October 2015.

[19] This data is based on a sample of N = 36, due to the fact that the question on sustainability was introduced to the assessment questionnaire after 2010.

[20] On a rating from 1 (not applicable) to 7 (fully applicable), Bulgarian companies in the sample average 4.5 compared to an average of 5.3 for the rest of the world.

[21] On a rating from 1 (not applicable) to 7 (fully applicable), Bulgarian companies in the sample average 2.9 compared to an average of 2.0 for the rest of the world.

Figure 13. ASSESSMENT OF NEW IDEAS AND WAYS OF DOING BUSINESS



Source: IMP³rove – European Innovation Management Academy; data as of October 2015.

Box 3. A PROFILE OF IMP³ROVE – EUROPEAN INNOVATION MANAGEMENT ACADEMY

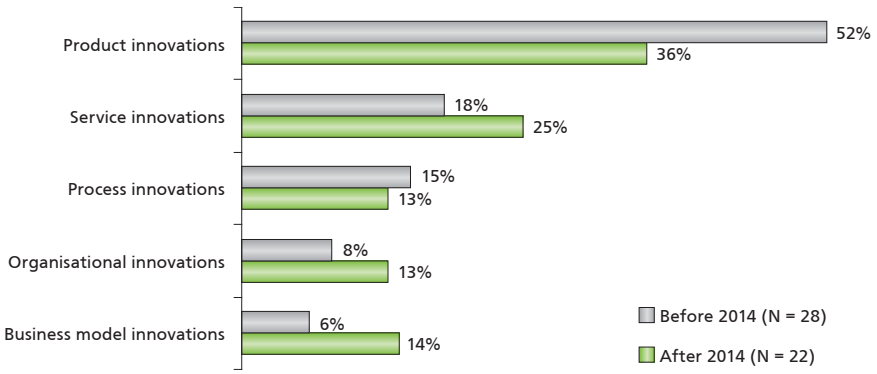
The IMP³rove – European Innovation Management Academy (www.improve-innovation.eu) offers innovation management support services to enterprises, consultants and intermediaries. It also provides financial actors, policy makers and academia with consulting support and technical assistance related to innovation and innovation management. The services include innovation management benchmarking for enterprises, training and certification in innovation management, research on innovation management issues and promotion of best practices in innovation management. With its global network, the IMP³rove Academy has set the standard for innovation management assessment. The IMP³rove – European Innovation Management Academy emerged from the European Commission's flagship program "IMP³rove". It was supported by the European Commission's Competitiveness and Innovation Framework Programme and receives continued support by Horizon2020.

Source: IMP³rove – European Innovation Management Academy.

spectively 35 % of Bulgarian companies in the sample systematically base the screening/evaluation and implementation of ideas on predefined criteria. Around 40 % of companies in the sample derive assessment criteria from the innovation strategy. This shows that there is room for improvement in linking innovation process decisions to strategy.

Budget for long-term innovation projects is a key enabling factor for innovation success over time. The Bulgarian companies assessed allocate more than a quarter of their innovation budget to long-term projects, compared to one fifth for the rest of the world. These figures underline the positive strategic prospects of the analysed Bulgarian companies.

Figure 14. ALLOCATION OF OPERATIONAL PROFITS FROM INNOVATION



Source: IMP³rove – European Innovation Management Academy; data as of October 2015.

In terms of **innovation results**, product innovation was the predominant

driver of innovation profits before 2014. In the past two years, service innovations, organisational innovations and business model innovations have become increasingly important for profit generation (see Figure 14).

Overall, Bulgarian companies in the sample expect an increasing impact of innovation management on their business. On a scale from 1 (very low) to 7 (very high), current impact is assessed at 5.3 and is expected to grow to 6.2 in the future – indicating a strong awareness of the benefits of an effective and efficient innovation management. Taking into consideration the need of the capability development summarised in this section *Innovation.bg*, it would be safe to conclude that significant further potential could be unlocked.

Technological Product

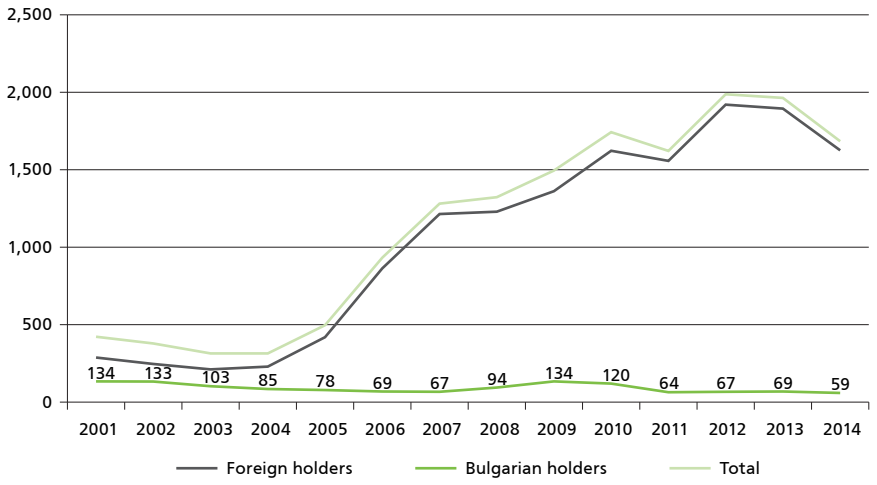
The technological product (protected and unprotected new technological knowledge) is a result of the creative activities of the participants in the innovation process. Its unique characteristics and economic significance make it attractive as an object of transfer. The analysis of applicant and patent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

In the period 2001 – 2014, a total of 15,954 patents were granted for the territory of Bulgaria, most of them (14,678 or 92 %) belonging to foreign patent holders and 1,276 or less than one tenth belonging to Bulgarian patent holders.

Over 92 % of the foreign patents were granted by the European Patent Office with effect on the territory of Bulgaria, i.e. **foreign patent holders have no preference for the Bulgarian market and do not have specific strategies for market presence in Bulgaria**. On the contrary, the territory of the country is seen as part of the common European market which is why it is of interest to foreign patent applicants.

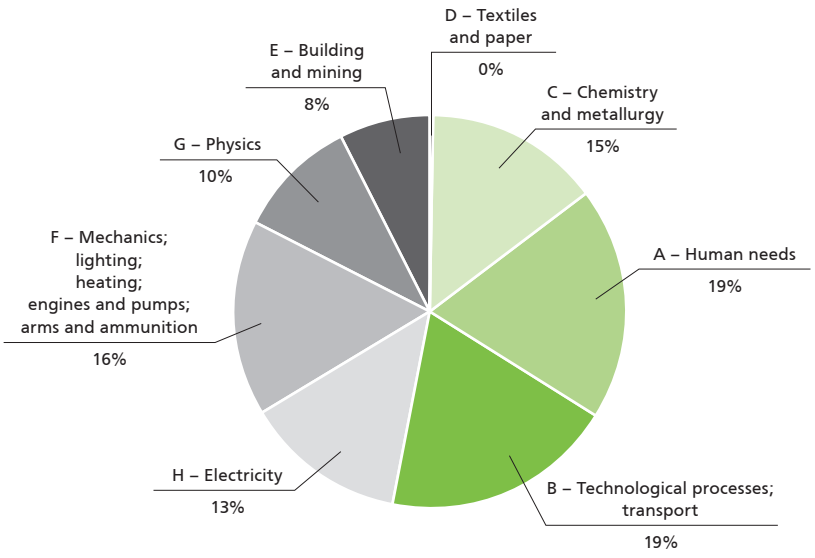
Over the last five years, the **patent activity of Bulgarian patent holders has declined considerably,** reaching a mere 44 % in 2014 of the peak level in 2009. Considering the lag of about 3-4 years for issuing a patent by the Patent Office of the Republic of Bulgaria (PORB), the beginning of the downward trend coincides with the beginning of the economic crisis. The slowdown in foreign patent activity

Figure 15. PATENT ACTIVITY DYNAMICS IN BULGARIA, 2001 – 2014, NUMBER OF PATENTS



Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

Figure 16. STRUCTURE OF THE PATENT ACTIVITY OF BULGARIAN PATENT HOLDERS BY FIELD OF TECHNOLOGY 2001 – 2014, %



Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

Table 1. **TOP 10 FIELDS OF TECHNOLOGY (IPC CLASS) ACCORDING TO TOTAL PATENT ACTIVITY IN BULGARIA, 2001 – 2014**

No.	IPC class	Name	Total	%
1	C07	Organic chemistry: general methods; acyclic, carboxyl, heterocyclic compounds; sugar; steroids; proteins	**3,839**	24.06
2	A61	Medical or veterinary science; hygiene; dentistry; medicinal preparations	**3,636**	22.79
3	B65	Conveying; packing; storing	**589**	3.69
4	C12	Biochemistry; beer; spirits; wine; microbiology; enzymology; genetic engineering.	**583**	3.65
5	A01	Agriculture; forestry; animal husbandry; hunting; trapping; fishing; pesticides; herbicides; disinfectants	**525**	3.29
6	H04	Electric communication technique; transmission; secret communication; telephonic communication; pictorial communication (e.g. TV); wireless communication networks	**384**	2.41
7	H01	Basic electric elements: cables; conductors; insulators; resistors; magnets; detectors; transformers; capacitors, switching devices; resonators, etc.	**320**	2.01
8	A23	Foods and foodstuffs; their treatment; milk; butter; coffee; tea; chocolate; confectionery	**274**	1.72
9	B01	Physical or chemical processes or apparatus – dissolving, emulsifying, dispersing	**271**	1.70
10	G01	Physics – measuring; testing	**271**	1.70
Total Top 10			**10,629**	**67.0**
Total all			**15,954**	100.0

Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

has been less pronounced and has taken place over the last two years.[22]

The interest of Bulgarian patent holders is almost equally distributed among technological patent classes. The only exception is "Textiles and paper" (section D), where only two patents were granted to Bulgarian patent holders during the entire analysed period. Most attractive to foreign patent holders are "Chemistry and metallurgy" (section C, 5,179 patents) and "Human needs" (section A, 4,741 patents), and it is in these classes that the difference between Bulgarian and foreign patent holders is most significant. Sixty-seven percent of all granted patents belong to the Top 10 fields in terms of patent activity in the period, including 71 % held by foreign persons and 39 % by Bulgarian holders.

As regards protection of new technological knowledge, Bulgaria is of interest mainly for European companies. Out of all 14,678 patents for innovation granted to foreign holders in the review period, 74.5 % are representatives of European countries. The share of the USA in foreign patent activity is 19.6 %. The other 5.9 % patents with foreign holders are distributed among 43 countries outside Europe, with Japan holding 526 patents (3.6 % of the foreign patents granted). The Top 15 patent holder countries in Bulgaria have 89.8 % of the total number of patents granted to foreign companies. Germany holds the biggest number of patents (3,050 – 20.8 %), followed by USA (19.6 %). About 1/3 of the patents are held by companies from Sweden, France, Italy and the United Kingdom, which accounts for some 39 % of the European patent share. The share of CEE countries that have patented their inventions in Bulgaria is 1.9 %. The highest patent activity is for Hungary, ranking 17th with 102 patents in total for the period, including 75 granted after 2006. It is followed by Poland (61), the Czech Republic (43) and Slovenia (34). The lowest rankings are held by Latvia (11 patents), Slovakia (6), Romania (5), Estonia (4) and Lithuania (1 patent).

There are significant variations in the distribution of the patents held by Bulgarians according to the type of holder. The largest number are individual holders who have 825 patents (64.7 % of the total number of patents for a period of 14 years), followed by the business sector with 314 patents (24.6 %), the public sec-

[22] Георгиева, Румяна. Институционален анализ на националната патентна активност в България за периода 2001 – 2014. Международна научна конференция на ТУ-Габрово „Унитех 2015" (20-21 ноември 2015 г.) [Georgieva, Rumyana. "Institutional analysis of the national patent activity in Bulgaria for the period 2001 – 2014". International scientific conference of Gabrovo TU "Unitech 2015" (20-21 November 2015)].

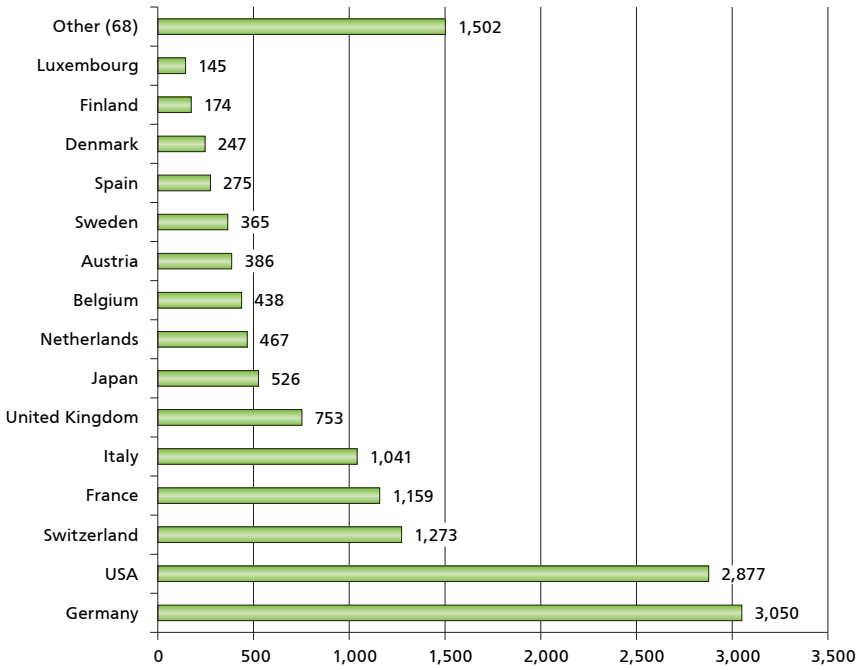
tor with 114 patents (8.9 %), and the higher education sector with 23 patents (1.8 %). In the period 2001–2014, there is a **clear decline in the share of individual holders at the expense of higher shares of the business and the public sectors.** This trend is typical of the whole period but is most pronounced after 2010, indicating that the low level of institutionalisation of patent activity in Bulgaria has been gradually overcome.

The share of **BAS** in the total number of Bulgarian patents (7.6 %) is over 4 times higher than that of the higher education sector. The greatest number of patents have been granted to the Institute of Management and Systemic Research – 24 patents (9 of which in 2013); the Institute of Metal Science – 16, and the Institute of Solid State Physics – 12 patents.

The patent activity of the **higher education** sector is very weak. This suggests lack of interest in shifting to higher value added activities and a focusing only on academic work. Only 8 out of 51 higher schools hold patents. The Medical University of Sofia holds the greatest number of patents (6), which were granted at the beginning of the period. It is followed by the Technical University of Varna and the Chemical Technological and Metallurgical University with four patents each. Three patents are held by the Higher School of Civil Engineering "Lyuben Karavelov" of Sofia and the Technical University of Sofia. The National University "Vasil Levski" of Veliko Tarnovo, the National Academy of Arts of Sofia, and the Technical College in Yambol have one patent each.

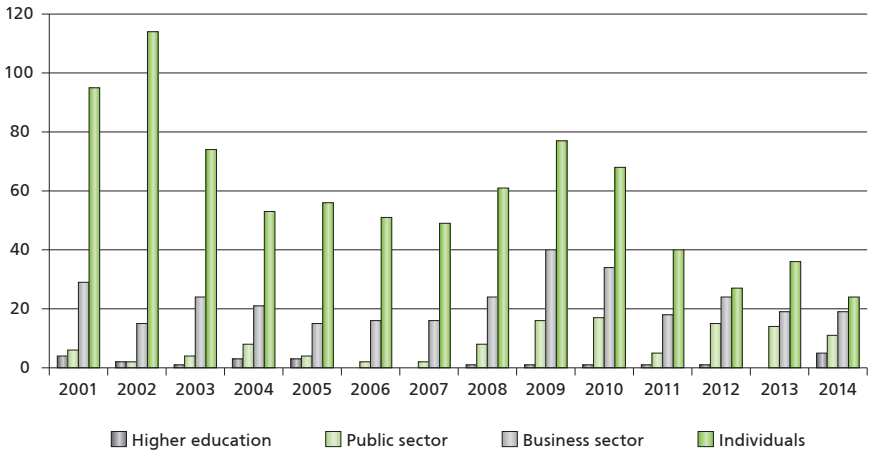
The business sector holds 314 patents in total for the period, distributed in 41 towns. The most active companies come from Sofia, Plovdiv, Sopot, Peshtera, Dupnitsa, Kazanlak, Varna, Razgrad, Ruse, Gabrovo, where 81.2 % of Bulgarian patents are concentrated. **The patent activity of the private sector has been generated by 182 companies.** Of these, 22 have 3 and more patents and the total number of their patents (133) comprises 42.4 % of the patents of all companies in Bulgaria for the period.

Figure 17. TOP 15 PATENT HOLDER COUNTRIES IN BULGARIA, 2001 – 2014, NUMBER



Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

Figure 18. INSTITUTIONAL STRUCTURE OF BULGARIAN PATENT ACTIVITY, 2001 – 2014, NUMBER



Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

In terms of sector classification (NACE 2008), **manufacturing enterprises have the highest share – 74 %** (941 patents of enterprises registered in Bulgaria). With almost equal shares but well behind the first place are the sectors "Transport, storage

Table 2. **BULGARIAN COMPANIES HOLDING 3 AND MORE PATENTS, 2001 – 2014, NUMBER**

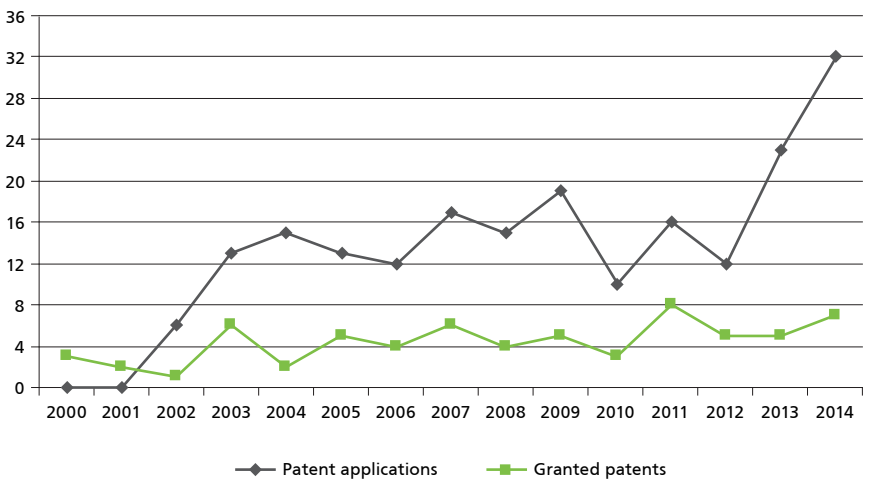
	Company	2001 – 2014	After 2007
1	"HYUNDAY HEAVY INDUSTRIES CO. BULGARIA" AD, Sofia	23	23
2	"SOPHARMA" AD, Sofia	21	20
3	"VMZ" EOOD, Sopot	14	9
4	"BIOVET" AD, Peshtera	9	1
5	"BALKANPHARMA-DUPNITSA" AD, Dupnitsa	7	0
6	"BALKANPHARMA-RAZGRAD" AD, Razgrad	6	0
7	"ARSENAL" AD, Kazanlak	5	2
8	"LB BULGARICUM" EAD, Sofia	5	2
9	KCM AD, Plovdiv	4	3
10	"NPP-KOZLODUY" ЕАД, Козлодуй	3	1
11	"AMV-AGRO" OOD, Plovdiv	3	3
12	"DENDRIT" OOD, Sofia	3	1
13	EVROCONSULT OOD, Plovdiv	3	3
14	"ZEOREX INTERNATIONAL" ЕООД, Sofia	3	0
15	"YONTEH" OOD, Sofia	3	0
16	NEOCHIM AD, Dimitrovgrad	3	1
17	"NITI-AD" EAD, Kazanlak	3	2
18	"SKGT-ELEKTROTRANSPORT" AD, Sofia	3	0
19	SOLID-55 OOD, Sofia	3	1
20	LACTINA OOD, Bankya	3	3
21	"NIHFI" AD, Sofia	3	0
22	"PROMAX-99" OOD, Sofia	3	3

Source: Based on data from the Official Gazette of the Patent Office of the Republic of Bulgaria, 2015.

and posts" – 9 % (112) and "Civil engineering" – 8 % (99). Within the manufacturing industry the **technological know-how in the country is concentrated in the medium high-tech sector** (slightly over 48 % of all Bulgarian patents) **and the high-tech sector** (16 %).

In the period 2000 – 2014, the number of patents granted to Bulgarians in the **European Patent Office** has been relatively steady, while patent applications have increased, more significantly after 2012. For the entire period, 203 European applications were submitted and 66 European patents were granted to Bulgarian patent holders. Bulgarian individuals still do not avail themselves adequately of the favourable opportunities by submitting international applications for patenting their inventions.

Figure 19. **BULGARIAN PATENT ACTIVITY AT THE EUROPEAN PATENT OFFICE, 2000 – 2014, NUMBER**



Source: EPO, 2015.

Most (83.2 %) of the Bulgarian **applications** to the European Patent Of-

Table 3. EUROPEAN PATENTS OF BULGARIAN HOLDERS, BY FIELD OF TECHNOLOGY, 2003 – 2014[23]

	Field of technology	Total		Field of technology	Total
1	Engines, pumps, turbines	7	14	Thermal processes and apparatus	2
2	Other special machines	5	15	Materials metallurgy	2
3	Pharmacy	5	16	Control	1
4	Handling	5	17	Civil engineering	1
5	Medicinal equipment	3	18	Macromolecular chemistry	1
6	Machine tools	3	19	Machine elements	1
7	Furniture	3	20	Audio-visual technology	1
8	Food chemistry	3	21	Transport	1
9	Measurement	3	22	Electrical machinery, apparatus	1
10	Textile and paper machines	3	23	Telecommunications	1
11	Organic chemistry	2	24	Civil engineering	1
12	Biotechnology	2	25	Digital communication	1
13	Basic materials chemistry	2		**Total**	**60**

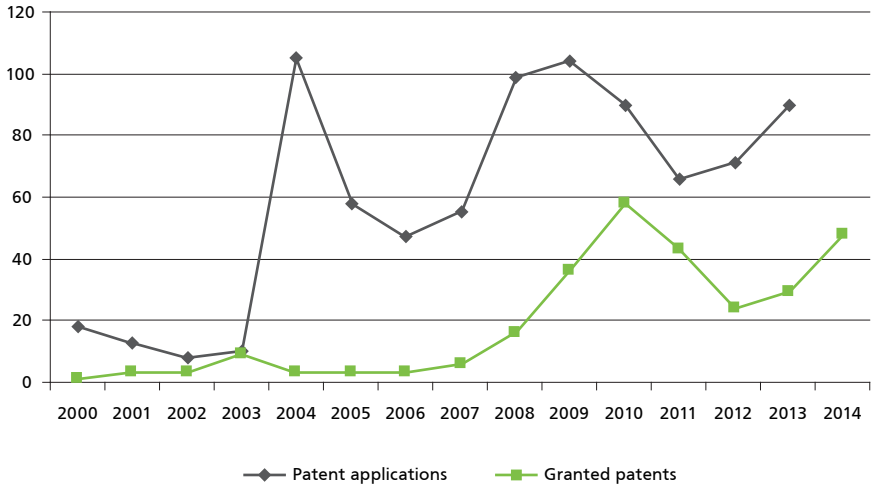
Source: EPO, 2015.

fice have been made in 20 fields of technology (with five and over five applications). As regards the **European patents granted** to Bulgarian holders, two and more patients have been granted in 15 fields of technology, and one patent in each of the other 10 fields.

There is about 70 % overlap between the top 5 fields of technology in terms of applications and patents granted. The two rankings do not match in full due to various factors, the most important one being the technological level of the created new knowledge. Data show that about 2/3 of Bulgarian applications are declined. A case in point is the "Textile machines" field with a total of 11 applications filed in the period 2003 – 2014 and only 3 European patents. Such findings raise questions as to the quality of the technological products created by Bulgarian individuals.

Bulgarian patent activity at the **US Patent and Trademark Office** in the period 2000 – 2014 differs significantly from that before the EPO. A total of 834 patent applications were filed and 285 US patents were granted. This reveals a stronger interest

Figure 20. BULGARIAN PATENT ACTIVITY AT THE US PATENT AND TRADEMARK OFFICE, 2000 – 2014, NUMBER



Source: USPTO, 2015.

of Bulgarian applicants in patenting and commercialisation of their technological products on the territory of the USA. As with the EPO, the issue is the quality of patent applications, as they are over three and a half times the number of granted patents. In addition, these data also show the continuing domination of the USA over Europe in terms of technological innovation. This explains the increasing interest of Bulgarian applicants in the entry into force of the Transatlantic Trade and Investment Agreement.

In the period 2008 – 2014, most of the 254 patents granted to Bulgarian patentees have been in the field of **business software**. 73.2 % of the

[23] http://www.epo.org/about-us/annual-reports-statistics/statistics/granted-patents.html

Table 4. BULGARIAN HOLDERS OF PATENTS, GRANTED BY THE US PATENT AND TRADEMARK OFFICE, 2010 – 2014[24]

	Patentee[25]	2010	2011	2012	2013	2014	Total	%
1	SAP AKTIENGESELLSCHAFT	50	33	14	8	27	**132**	75.4
2	Individual patentees	3	3	3	9	8	**26**	14.9
3	ATMEL CORPORATION	1	0	0	2	3	**6**	3.4
4	RED HAT, INC.	0	1	1	2	2	**6**	3.4
5	SANBOLIC, INC.	1	1	0	1	0	**3**	1.7
6	RAYSAT CYPRUS LIMITED	1	1	0	0	0	**2**	1.1
	Total	**56**	**39**	**18**	**22**	**40**	**175**	100.0

Source: USPTO, 2015.

patents are in the top 10 fields of technology (18.2 % of all 55 fields).

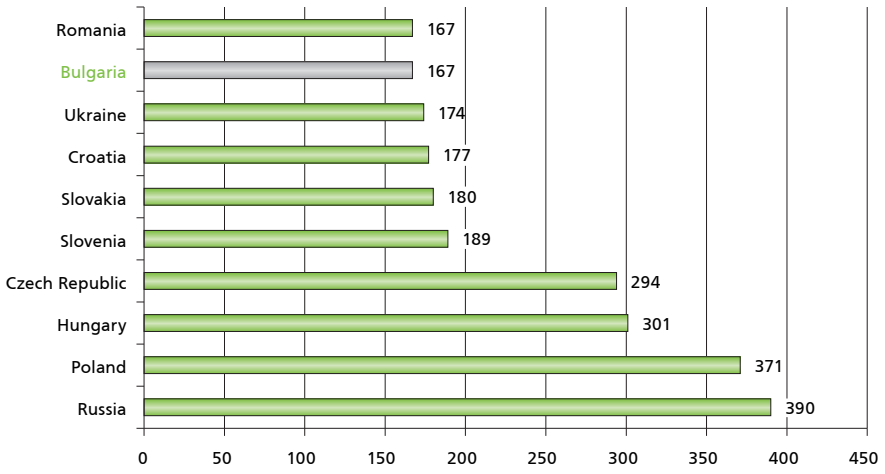
As to the type of patentees, in the period 2010 – 2014 only about 15 % of Bulgarian patentees in the USA were individuals – individual inventors, and the other were businesses. The highest patent activity is that of the company Sap Bulgaria EOOD, which was granted 132 US patents (75.4 % of the US patents of Bulgarian patentees), followed by the companies Atmel Corporation and Red Hat, Inc. with 6 patents each, Sanbolic, Inc. – 3 patents, and Raysat Cyprus Limited – 2 patents.

Another notable feature of the patent activity is that patentees typically have more than 5 patents. This is confirmed by the fact that 170 patents (97.1 % of all granted patents in the period 2010 – 2014) are held by patentees with over 5 patents.

Research Product

New scientific knowledge is an important condition for enhanced innovation activity in the country. The analysis of the dynamics and structure of the process reveals the potential of Bulgaria to successfully fit in the global scientific networks, its comparative advantages in various fields of knowledge and its ability to successfully compete on the market for intellectual products.

Figure 21. TOP 10 COUNTRIES FROM EASTERN EUROPE BY NUMBER OF PUBLICATIONS IN SCOPUS DATABASE, 1996 – 2014, H INDEX[26]



Source: SCImago. (2007). SJR – SCImago Journal & Country Rank. Retrieved September 10, 2015, from http://www.scimagojr.com

In the period 1996 – 2014, Bulgarian scientists published 54,894 pieces referenced in the SCOPUS database. **In 2014, for a second year in a row there was a decline in the number of publications** which fell to 3,480 – below the level of 2007 (3,531 publications) and by 13 % below the peak 2012 (3,999 publications).

Bulgaria ranks 51st in the international ranking by number of publications and on the 47th place by H-index. In the regional statistics for Eastern Europe, Bulgaria holds 10th and 9th place respectively by these two indicators. Global leaders are the USA (8,626,193 documents, H-index 1648), the United Kingdom (2,397,817 documents and H-index

[24] http://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcasg/bgx_stcorg.htm

[25] Classifying patents to a given country of origin is based on the first stated patent holder. In most cases these are subsidiaries of large international corporations.

[26] The scientific measurement indicator h-index is known as the Hirsch index after the name of the Californian physicist Jorge E. Hirsch, who suggested it in 2005. It measures both the productivity and citation impact of the published body of work of a scientist, group or institution. The value of the h-index is calculated on the basis of the most cited publications: counting those *h* in number among them which were cited at least *h* times. H-index is the only figure which corresponds to this definition. This can practically be done by recording in consecutively numbered lines the number of citations of every article in descending order – *h* is where the number of the line becomes larger than the figure written on that line.

1015) and Germany (2,176,860 documents and H-index 887). **Among the new EU member states, Bulgaria holds seventh place by number of publications** after Poland (24th place), Hungary (31), Czech Republic (33), Slovenia (41), Slovakia (43), and Croatia (44).

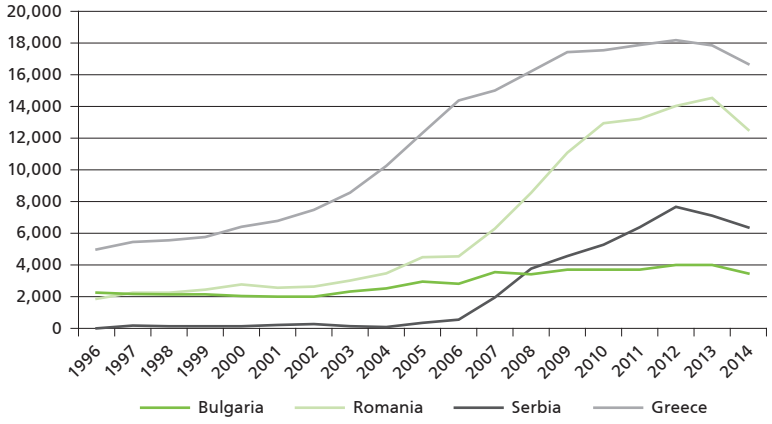
The increase in the number of publications reported by Bulgaria in the last almost 20 years is steady, albeit being at a very low pace. This **prevents the country from realising its comparative advantages in the Balkans**. The latter, although comprising old (Greece) and new (Romania) EU members, as well as candidates for membership (Serbia) – and therefore developing research based on different growth factors – managed to achieve equally strong growth of publication activity after 2007. The decline in publications in the last two years is typical of the whole region and is most pronounced in Serbia (some 20 %).

Bulgaria's positions in terms of **joint research activity and dissemination of results from international projects are much better.** Despite variations, **Bulgaria retained its leading positions in the region almost throughout the review period.** Although this is a positive development in regard to joint research, the comparatively low general publication activity reflects the lack of established autonomous schools of specialisation.

The leading areas of publication are physics and astronomy (13 % of all publications), medicine (12 %), science of materials (10 %), engineering sciences (9 %) and chemistry (9 %), which account for slightly over half of the research result of Bulgarian scientists. Very closely behind are biochemistry, genetics and molecular biology (8 %).

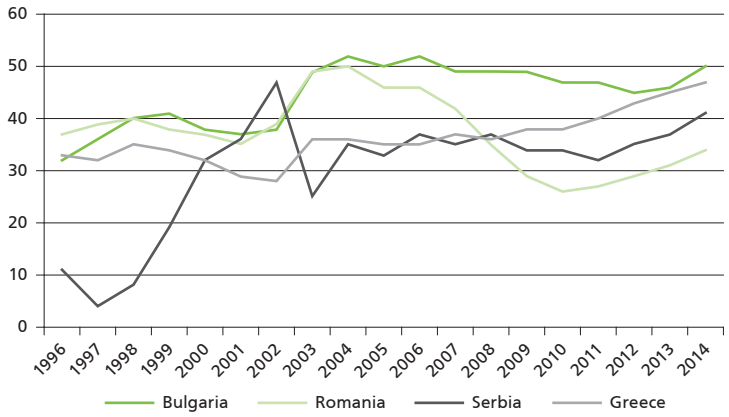
In higher education, **Sofia University leads in three areas of science – physics and astronomy, materials**

Figure 22. PUBLICATION ACTIVITY IN SCOPUS DATABASE, 1996 – 2014, NUMBER OF DOCUMENTS



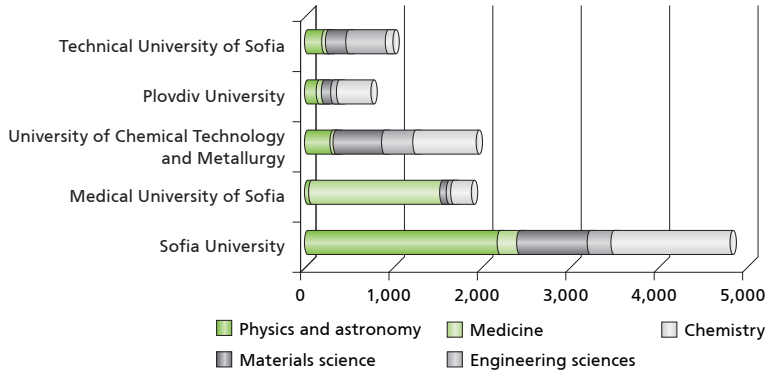
Source: SCImago. (2007). SJR – SCImago Journal & Country Rank. Retrieved September 10, 2015, from http://www.scimagojr.com

Figure 23. SHARE OF PUBLICATIONS WITH INTERNATIONAL PARTICIPATION (TWO AND MORE COUNTRIES) IN SCOPUS DATABASE, 1996 – 2014



Source: SCImago. (2007). SJR – SCImago Journal & Country Rank. Retrieved September 10, 2015, from http://www.scimagojr.com

Figure 24. COMPOSITION OF THE PORTFOLIO OF PUBLICATIONS OF SOME BULGARIAN UNIVERSITIES, 2000 – 2014, PUBLICATIONS PER SCIENCE FIELD



Source: SCOPUS, 2015.

Table 5. TOP 15 BULGARIAN JOURNALS REFERENCED IN SCOPUS

		H-index
1	Applied Mathematical Sciences	21
2	ZooKeys	19
3	Oxidation Communications	17
4	Biotechnology and Biotechnological Equipment	15
5	Folia Medica	14
6	International Journal of Mathematical Analysis	12
7	Revmatologia (Rheumatology)	12
8	Advanced Studies in Theoretical Physics	10
9	Biomedical Reviews	10
10	Comptes Rendus de L'Academie Bulgare des Sciences	10

Table 6. TOP 15 BULGARIAN JOURNALS REFERENCED IN SCOPUS

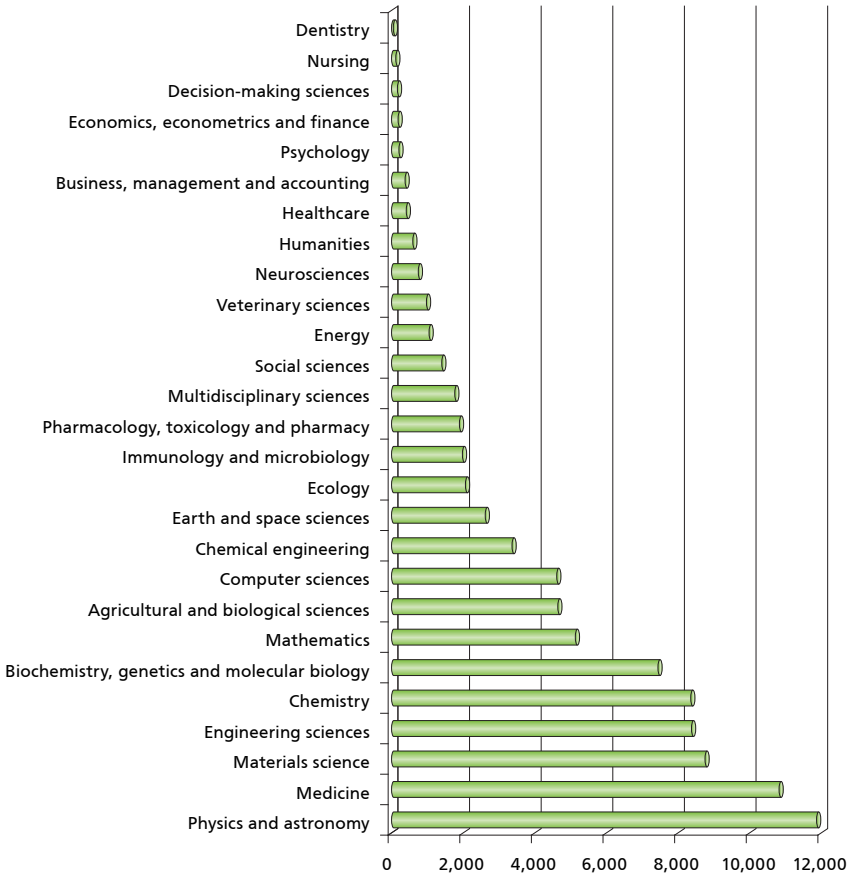
		SJR[27]
1	BioRisk	0,584
2	ZooKeys	0,526
3	Comparative Cytogenetics	0,428
4	Applied Mathematical Sciences	0,335
5	Journal of Geometry and Symmetry in Physics	0,310
6	Acta Zoologica Bulgarica	0,270
7	Journal of the Balkan Tribological Association	0,242
8	International Journal Bioautomation	0,228
9	International Journal of Mathematical Analysis	0,228
10	Oxidation Communications	0,228

Source: SCImago. (2007). SJR – SCImago Journal & Country Rank. Retrieved September 10, 2015, from http://www.scimagojr.com

science, and chemistry. In the engineering sciences the University of Chemical Technology and Metallurgy and the Technical University of Sofia have close positions. A leader in the area of medicine is the Medical University of Sofia.

In 2014, there were 44 journals of Bulgarian research institutions referenced in the SCOPUS database (one less than in 2013). In the top 15 of Bulgarian journals there were small shifts in the ranking according to the main quality indicators: H-index and SJR.

Figure 25. PUBLICATION ACTIVITY OF BULGARIAN SCIENTISTS BY SCIENCE FIELD IN SCOPUS DATABASE, 1996 – 2014, NUMBER OF DOCUMENTS



Source: SCImago. (2007). SJR — SCImago Journal & Country Rank. Retrieved September 10, 2015, from http://www.scimagojr.com

[27] The scientific measurement indicator SCImago Journal Rank (SJR) is used in the SCOPUS database. SJR is an indicator, like GoogleRank, which measures the prestige of reviewed scholarly journals based on citations for a period of three years.

Entrepreneurship and Innovation Networks

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

Given the relatively small average size of Bulgarian companies in terms of assets, it is essential for them to join in active networks. Clusters are one of the contemporary forms of interaction, in addition to business associations.

Innovation clusters in Bulgaria

As an actual player in the market economy and the natural outcome of the interaction of business partners/competitors with intersecting interests, clusters reflect the developments in today's global economy: **globalisation of business; changes in the scope of technological value added chains**; **identification of emerging economic sectors of related industries.**

National and supranational policies in support of clusters more or less follow the emergence and developments of these trends internationally, i.e. more or less they **are a follow-up.** As the growth of business clusters in Bulgaria depends almost fully on policies and public finance, cluster activity in the country logically lags behind those global trends. Despite the delay, however, over the past two decades clusters in Bulgaria have changed their relevance, place and role in the national economy. There are two clearly discernible stages in their development, which highlight the focus of national policy and reflect the changed attitude and behaviour of the players.[28]

Phase 1: Introducing the cluster approach and establishing a pilot cluster model: 2003 – 2008

The process of creating business clusters and government support for them in Bulgaria started in 2003 with a project under the PHARE Programme implemented in two phases.

In the **first phase,** a project for introducing a cluster approach and establishing a pilot cluster model with a budget of EUR 800,000 was implemented. As a result of it, two pilot clusters were created: Cluster for Furniture Manufacture – Troyan; and Rhodope Cluster for Tourist Services – Smolyan.

Despite the complicated methodology for selection of beneficiaries (two stages of selection, a system for assessing the potential of the subsectors of the Bulgarian economy with a set of indicators in five areas, a panel of experts), as well as the presence of factors for potential success (strong industry organisation, atmosphere of cooperation and trust among companies, existing active companies) at the end of 2015 there was no information whether the two clusters set up under the project are active or whether they continue to exist in any legal or informal form.

In the **second stage,** a project titled "Initiatives for development of clusters" was implemented. Out of 14 cluster applicants, grant contracts were concluded with 10 for a total value exceeding EUR 1 million. At the end of 2015, **three clusters were active** (ICT cluster, mechatronics and automation cluster, and marine cluster Bulgaria with total funding of EUR 206,000), **one has been closed, four have been registered but not active, and no official information was available on the other clusters**.

The results of the first stage of public support for cluster activity in Bulgaria are as follows:

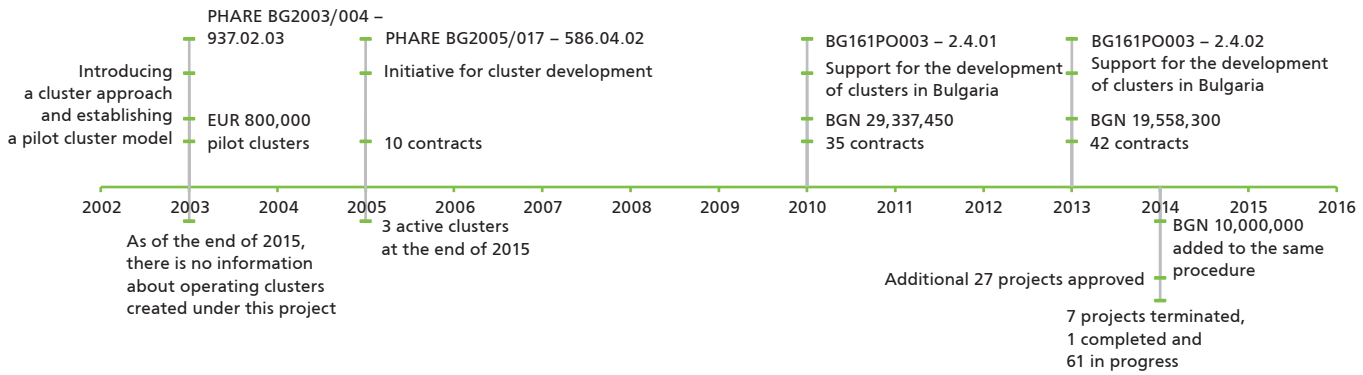
- EUR 1,800,000 contracted;
- 12 registered clusters, including 9 not surviving;
- 3 active clusters at the end of 2015, having utilised 11 % of the provided grants.

Phase 2: Development of clusters in Bulgaria: 2009 – 2015

The second stage of development of clusters in Bulgaria coincided with the country's full membership in the EU. The main financial support was provided under the OP "Competitiveness of the Bulgarian Economy" and exceeded considerably the financial resources for the same purposes that had been provided before. In 2010, the first procedure for the project "Support for the development of clusters in Bulgaria" was launched with a budget of BGN 29,337,450. Thirty-five contracts for a total of BGN 8,994,670 were signed, with BGN 4,823,399 already disbursed. The second proce-

[28] Analysis of clusters in Bulgaria, ABC, 2015; Bulletin "Science and Business", 2013.

Figure 26. SUPPORT FOR THE DEVELOPMENT OF CLUSTER PRACTICES IN BULGARIA



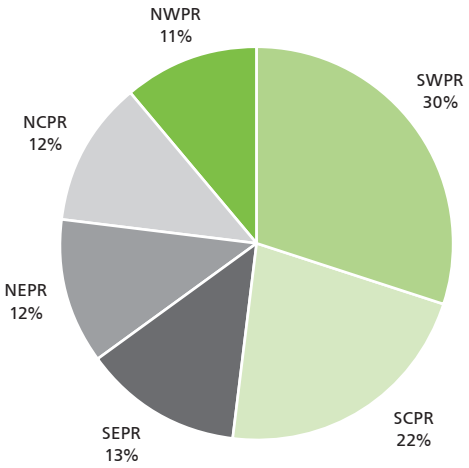
Source: Applied Research and Communications Fund, 2015.

dure "Support for the development of clusters in Bulgaria" was launched at the beginning of 2013 with a budget of BGN 19,558,300, with another BGN 10,000,000 added to it in January 2014.

Out of all 111 applicants participating in the project, 42 were approved, 26 were declined, and 43 were put on a reserve list. As a result of the joint efforts of the Association of Business Clusters, employer organisations and the media serious weaknesses were detected in the evaluation of the projects, which led to the review of the procedure and to the approval of 27 more projects from the reserve list (March 2014). As a result, the budget of the procedure was almost fully contracted in 69 contracts (BGN 29,408,637). Later on, 7 contracts were terminated, 1 was completed and 61 are in progress as of the end of 2015; payments made by April 2015 amounted to BGN 7,430,710.

At present, based on data from the Commercial Register, Bulstat and the Company Division of Sofia City Court there is information on about 260 companies and associations with the name "cluster", including 17 discontinued. There are 99 clusters having an operating administrative body and almost all of them are funded under OP "Competitiveness". There

Figure 27. GEOGRAPHICAL DISTRIBUTION OF CLUSTERS IN BULGARIA, NUTS 2[29]



Source: Cluster Mapping Tool, 2015.

are 550 employees at the clusters for whom social security contributions are made.

The state of the clusters in Bulgaria according to the EC Cluster Mapping Tool is slightly different. The tool is part of the services provided within the European Cluster Observatory and ensures sector and inter-sector regional data about geographical concentration and economic performance of clusters in EU aimed at designing an evidence-based cluster policy.

The database contains information about 144 clusters operating on the territory of the country, 30 % of these being situated in SWPR, followed by 22 % in the SCPR. The other four planning regions have similar positions, the number of their clusters ranging from 16 to 19.

The economic sectors creating most favourable environment for the development of clusters are the medium and low technology sectors:

- **manufacture of wearing apparel** – 12 clusters, equally dis-

[29] http://ec.europa.eu/growth/smes/cluster/observatory/cluster-mapping-services/cluster-mapping/mapping-tool/index_en.htm

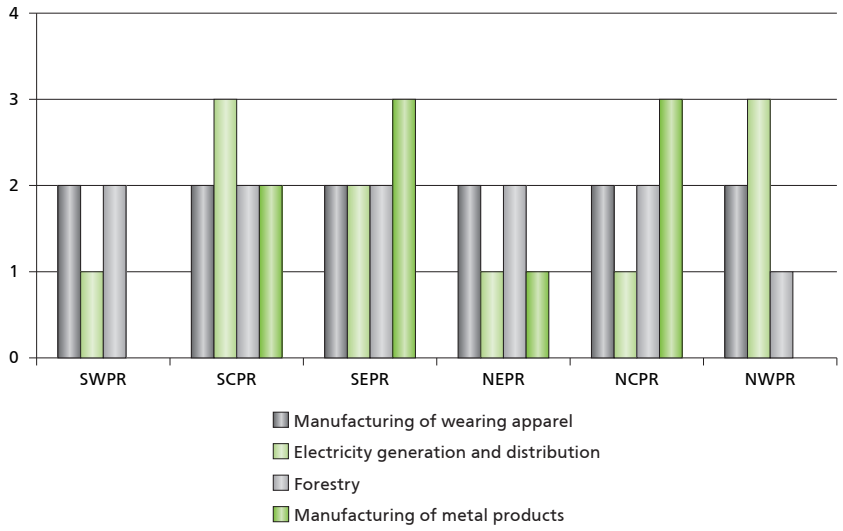
tributed on the territory of all 6 planning regions;

- **electricity generation and distribution** – 11 clusters, distributed on the territory of the whole country but with highest concentration (3 clusters each) in SCPR and NWPR;
- **forestry** – 11 clusters almost equally distributed on the territory of the whole country, the only exception being NWPR with 1 cluster;
- **manufacture of metal products** – 9 clusters including 3 clusters in SEPR and NCPR, 2 in SCPR and 1 cluster in NEPR.

The attention of the European Cluster Observatory is focused mainly on emerging industries. **Based on data about patent activity in border areas of knowledge and information about intercompany cooperation** (transactions on mergers and acquisitions, joint ventures and alliances) the Observatory has defined ten areas of activities:

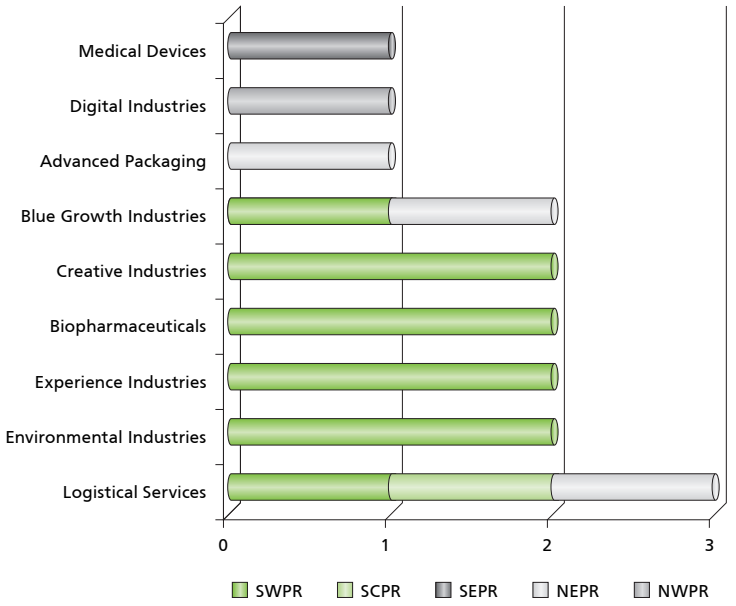
- **smart packaging** – includes the manufacturing of packaging from different materials (paper and cardboard, plastics, glass, aluminium, etc.), and providing comprehensive solutions for the preservation and storage of goods during their manufacturing, transportation and consumption;
- **biopharmaceuticals and pharmaceuticals** – includes the manufacturing of pharmaceutical products, as well as chemically synthesised and created after processing of natural raw materials;
- **"blue growth" industries** are related to the development and use of the potential of oceans, seas and related infrastructure, as well as the sources of drinking water and their exploitation;
- **creative industries** – based on the understanding of creativity as an economic resource, and provides opportunities for its capitalisation; these include publishing, musical, visual, media, film, photo industries, architecture and design;
- **digital industries** include the manufacturing of computers and computer components, programming and publication of software, providing digital communication infrastructure and related consulting services;
- **environmental industries** include all activities related in one way or another to the reduction of the harmful impact of human activity on the environment;

Figure 28. ECONOMIC SECTORS WITH HIGHEST NUMBER OF CLUSTERS



Source: Cluster Mapping Tool, 2015.

Figure 29. DISTRIBUTION OF CLUSTERS OF EMERGING INDUSTRIES BY PLANNING REGION



Source: Cluster Mapping Tool, 2015.

- **experience industries** include all services (excluding manufacturing) providing experiences to customers, which stimulate emotions and perceptions. This is the intersection of tourism, culture and leisure industries, on the one hand, and technologies and business, on the other hand;
- **logistical services** include management (planning, organisation, control) of the flow of goods and the process of their transportation to a given destination, at a precise time, in accordance with the requested quantity and quality, at the lowest possible price. In addition, they include all ancillary services related to the storage of goods, mailing and courier services, wrapping and unwrapping, and this industry almost fully covers the definition of the term "logistics";
- **medical devices** – manufacturing products for permanent or temporary substitution or support of the functioning of the human body;
- **mobility services** – based on the use of technologies enabling the movement of people and including the manufacturing of vehicles, construction of transport infrastructure and provision of transport services.

Emerging industries are a driver of economic transformations and growth by establishing entirely new technological value added chains or radically transforming existing ones as a result of the so-called destructive/creative innovations (or combinations of them) and manufacturing of new products/services. Emerging industries often incorporate already existing productions or entire economic sectors united by the impact of new technologies, market demand or new configurations of value added chains. Thus, **on the basis of enhanced inter-sector interaction emerging industries represent a favourable environment for the development of clusters**.

In Bulgaria, clusters represent nine out of the ten emerging industries, except for mobility industries. The highest concentration of such clusters is in SWPR (ten clusters in total), followed by NEPR with 3 clusters.

Investment and Financing for Innovation

Spending on research and innovation is a measure of the investment in the creation, use and dissemination of new knowledge in the public and business sectors. It is considered an indirect indicator of the innovation capacity of the national economies. A high ratio of R&D spending to GDP is a factor fostering dynamic economic growth and competitiveness.

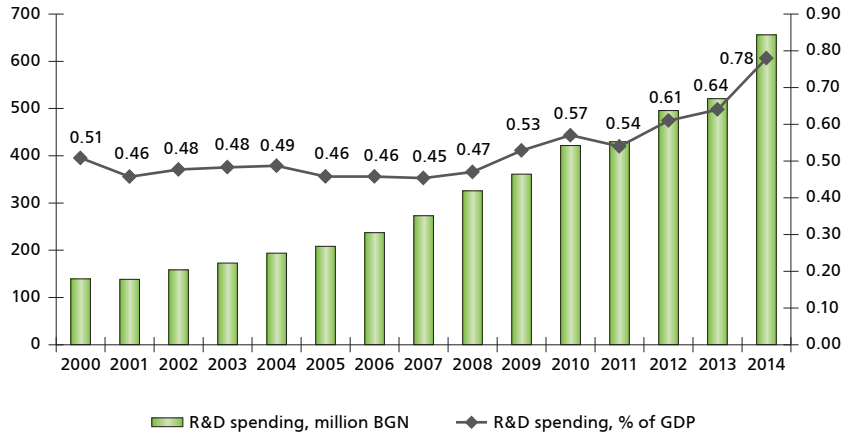
R&D spending

The increase in R&D spending in 2014 compared with the previous year is about 26 % (or 22 % as a share of GDP) and represents the most significant rise of that indicator after 2000. Since 2010, the majority of **R&D funds have come from foreign sources, incl. European structural funds, which are becoming increasingly important for the national economy.** In 2014, their share in total R&D spending was over 51 %. In practice, **external funding** (which has a pull effect with regard to business expenditure on R&D) **is becoming critical for the existence and development of the national research and innovation system**.

The highest year-on-year growth in R&D spending occurred in the business sector – about 38 %. Thus, the private sector continues to shorten the distance to the public sector, which is the second largest (after foreign funds) source of R&D spending with 27 %. **For a fifth year in a row the higher education sector has a reduced budget for research**. In 2014, spending through university research funds for R&D was halved, while the decrease compared to the peak 2009 was 90 %.

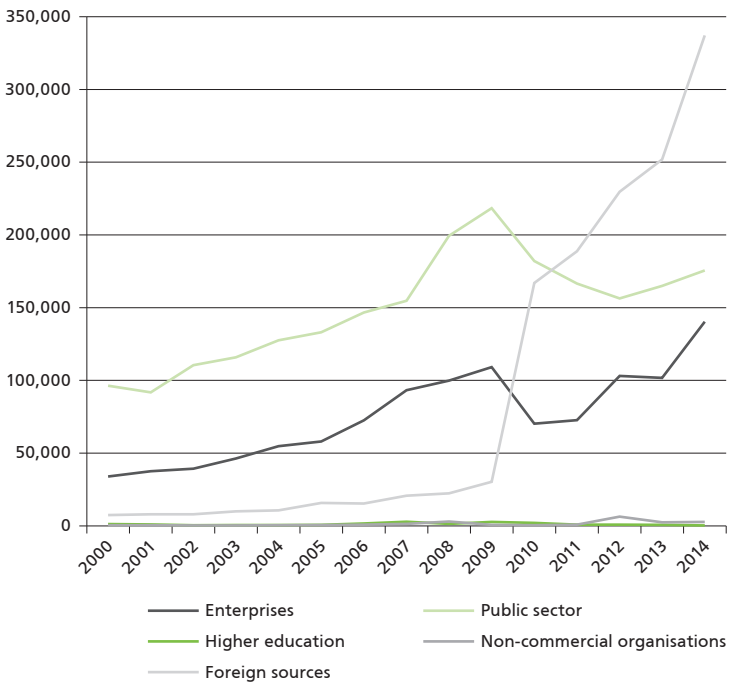
As the allocation of R&D costs by planning region shows, in **2014 the imbalances at the regional level in favour of SWPR were exacerbated.** However, as regards the share of the business sector in the budget of the respective regional economy, NCPR is leading (77 %), followed by SEPR (74 %) and SCPR (67 %). By this indicator SWPR

Figure 30. R&D SPENDING IN BULGARIA, 2000 – 2014



Source: NSI, 2015.

Figure 31. R&D SPENDING BY SOURCE, 2000 – 2014, TBGN



Source: NSI, 2015.

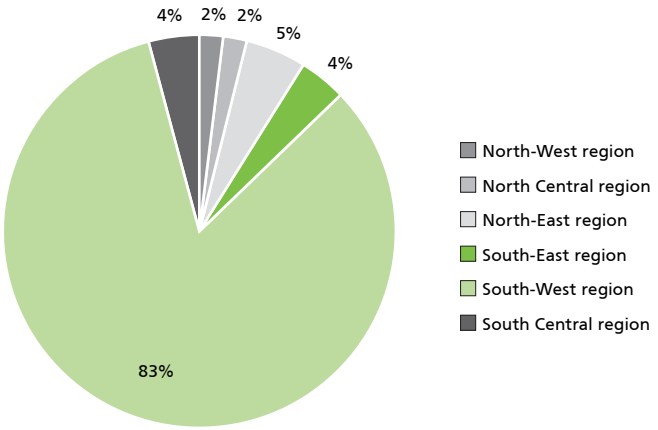
comes only fourth mostly due to the concentration of research institutions and universities in the city of Sofia.

In 2014, **the increase in R&D funds for technical sciences continued** – they almost doubled year-on-year. The same, albeit at a slower pace, applies to the other areas of science. **Only agricultural sciences make an exception with their budget reduced by 20** %. There is a **clear specialisation between the two main sources of R&D spending – the state and enterprises**, by area of science. **The private sector provides most of the funding for technical (80 %) and medical (94 %) sciences,** while public spending is focused on agricultural (85 %), humanitarian (79 %), natural (72 %) and social (59 %) sciences; in terms of the latter, the higher education institutions also have a considerable contribution of some 30 %. The more practical agricultural sciences seem to be in need of substantial reform and redefinition of the role of the Agricultural Academy.

The main problems of the Agricultural Academy are discussed in the chapter "Innovation Policy of the European Union and Bulgaria", especially its efforts to tap funding from the business sector. Addressing these problems is fully within the powers of government institutions. Given that the government cannot allocate the necessary financial resources for the development of agricultural science, it is imperative to introduce legislation which would protect the interests of the Academy as the main research centre in Bulgaria in this area.

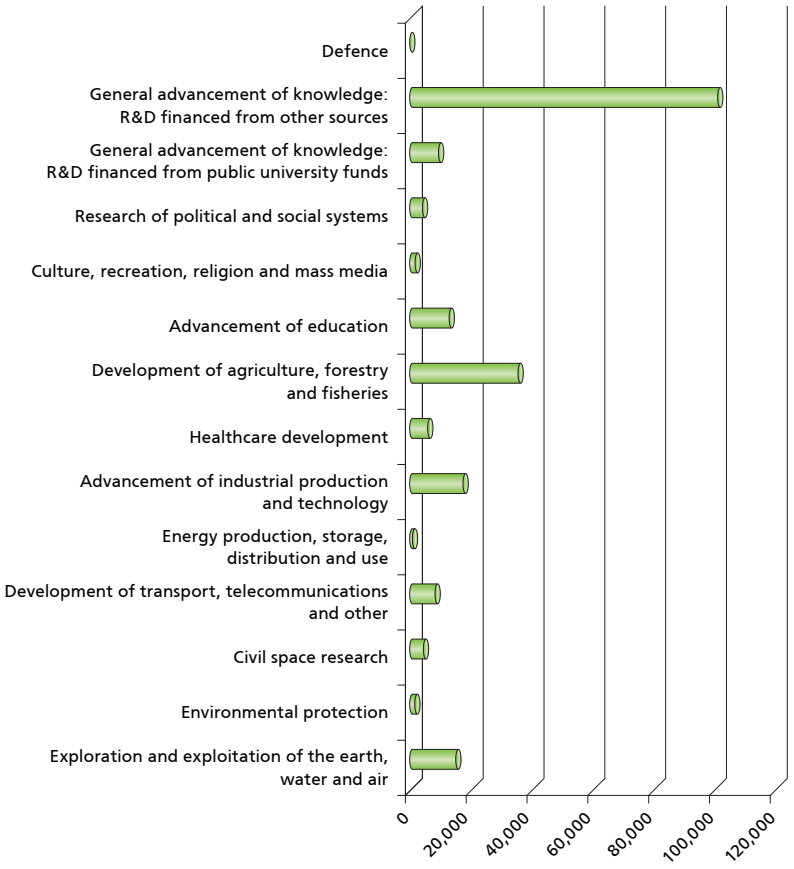
The biggest share in **budgetary spending on R&D by socio-economic objectives** is funding for fundamental research at BAS. This is provided under the item "General development of knowledge: R&D financed from other sources", which includes also costs for membership in CERN, the Institute for Nuclear Research in Dubna, etc. In addition, BAS receives funding for other thematic areas. Second with almost 17 % is funding under the field "Development of agriculture, forestry and fishery", which is mainly allocated to the AA.

Figure 32. REGIONAL DISTRIBUTION OF R&D SPENDING, 2014, %



Source: NSI, 2015.

Figure 33. BUDGET APPROPRIATIONS FOR R&D BY SOCIO-ECONOMIC OBJECTIVES, 2014, TBGN



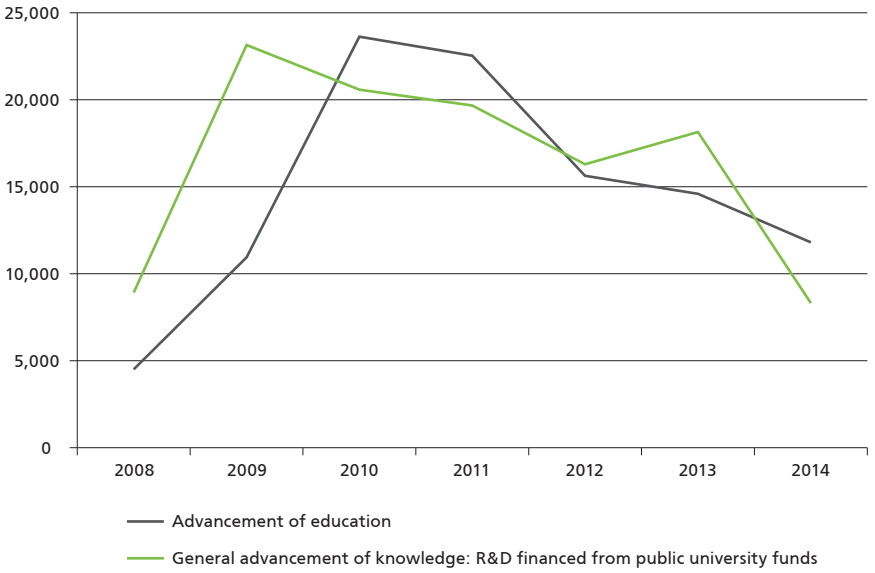
Source: NSI, 2015.

The big loser in the appropriation of public funds for research is education. In recent years, the government **has failed to advance education (the reduction is by some 20 % on 2013)**

and **has failed to develop the scientific potential of public universities (the reduction is by 55 % on 2013 and is below the level of 2008)**. That education is not among the national priorities is evident the series of government "measures", which include the latest intended amendments to the Education Act and the lack of interest in those leaving the country to study abroad (a hidden channel for "brain drain"). Given such a "reform" of the system, the data below evidencing that **Bulgarian universities cannot win and implement projects under European framework programmes for research and innovation** should come as no surprise.

In 2014, **spending on research in the defence system is almost 0.0 % of all budget appropriations for R&D. Since 2010, the funds for environmental protection research have been constantly decreasing** – by some 90 % over the period.

Figure 34. BUDGET APPROPRIATIONS FOR R&D IN THE EDUCATION SYSTEM, 2008 – 2014, TBGN



Source: NSI, 2015.

Bulgaria in Horizon 2020

Bulgaria began its participation in the eighth framework programme for research and innovation Horizon 2020 without making good use of the experience and momentum accumulated in 7FP.[30] Although in terms of submitted project proposals for the first 100 calls the country ranks 20th,[31] the share of projects which have been awarded funding has declined compared to the previous programming period:

- while most member states have increased their share of eligible projects in the total submitted proposals compared with 7FP, **Bulgaria has regressed on this indicator**;
- by the number of project proposals per 1 million inhabitants admitted for evaluation **Bulgaria does better than only Romania and Poland** with 103 projects, which is almost three times lower than the average number in EU-28 – 293 projects;
- **Bulgaria ranks last** in terms of the share of projects approved for funding within the total eligible projects, with about 11 % against 14 % on average for EU-28. This result is well below the success level in 7FP.

As of November 2015, Bulgarian organisations are beneficiaries on 99 projects with approved funding under Horizon 2020.[32] Research organisations are the most active ones, with institutes of BAS participating in 26 projects. **The Applied Research and Communications Fund comes second by number of projects with 4 projects, including one project as a coordinator** (a ranking which remains unchanged in respect of the total number of Bulgarian organisations).

Unlike the average for EU-28 where universities are the leading group among the beneficiaries, in Bulgaria they rank fourth with merely 9 higher schools receiving funding under Horizon 2020.

The private sector is represented by 22 organisations with 30 projects. Among the most active companies are Ontotex AD with 3 projects (awarded in 2014 in the category "Innovation Visionary" at the Innovative Enterprise of the Year Award held by ARC Fund) and the publisher Pensoft EOOD with 3 projects (which was very successful in 7FP as well). The **municipalities of Gabrovo and Pernik** are among the seven public organisations with projects under Horizon 2020.

The SME Instrument

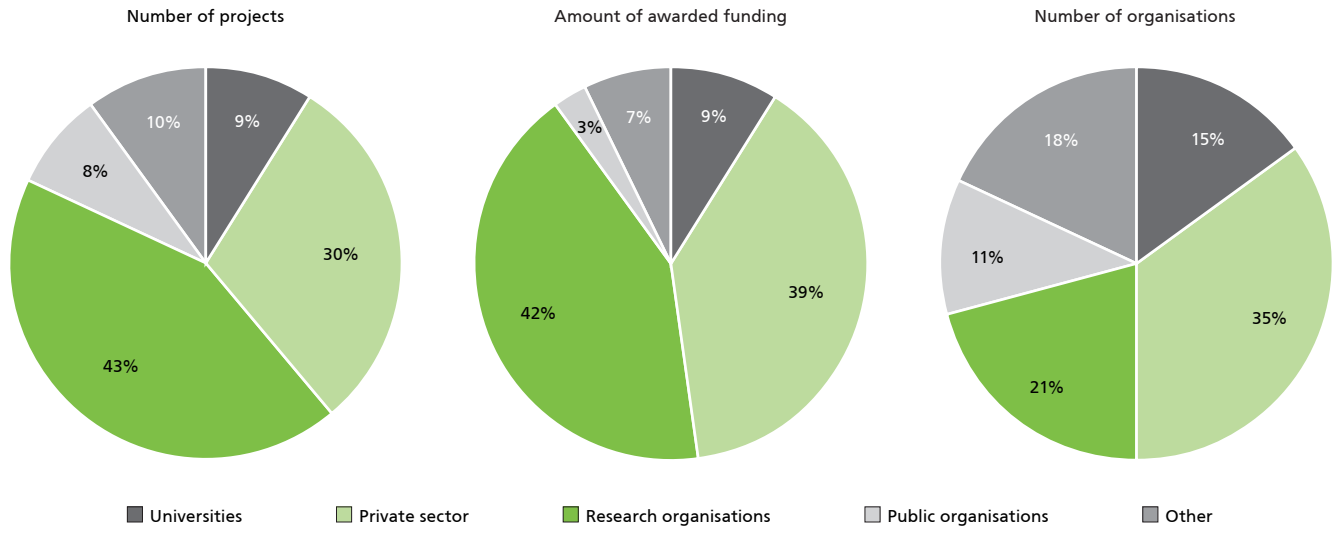
In the current programming period the SME Instrument under Horizon 2020 will provide funding for inno-

[30] *Innovation.bg 2013*, Applied Research and Communications Fund, 2013; http://www.arcfund.net/arcartShow.php?id=16740

[31] Ahead of Cyprus, Croatia, Estonia, Slovakia, Lithuania, Luxembourg, Latvia and Malta; Source: Horizon 2020, First results, EC, DG Research and Innovation, 2015; https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/horizon_2020_first_results.pdf

[32] https://open-data.europa.eu/en/data

Figure 35. PARTICIPATION OF BULGARIAN ORGANISATIONS IN HORIZON 2020



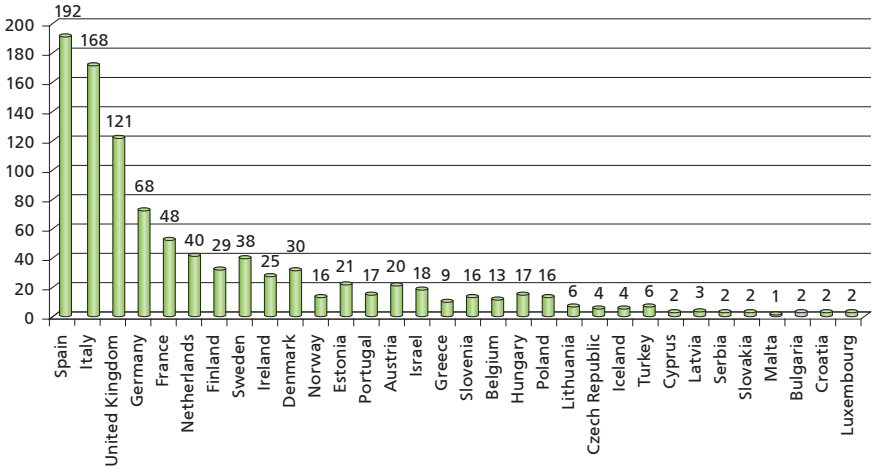
Source: EU Open Data Portal, 2015.

vation projects developed by one or several small and medium enterprises in the EU. Projects funded by the SME Instrument will be implemented in three stages, and application for each of them is consecutive. The proposal for funding is in the form of a business plan rather than the traditional detailed project proposal for Horizon 2020.

By number of project proposals admitted for review under the SME Instrument **Bulgaria ranks 18th within EU-28 with 11 projects per 1 million persons,** which is above the average for EU-28 – 9.26 projects. The first three places are held by companies from the new member states – Slovenia (79 projects), Estonia (65 projects) and Cyprus (35 projects); Romania is last with 3 projects.

In terms projects approved for funding Bulgaria is doing less well. After the completion of the first five sessions of the SME Instrument (three sessions for 2014 and two for 2015) the balance for Bulgaria is quite modest – **3 approved projects for stage one**:

Figure 36. PROJECTS APPROVED FOR FUNDING AFTER THE FIRST FIVE SESSIONS OF THE SME INSTRUMENT



Source: http://ec.europa.eu/programmes/horizon2020/en/news/sme-instrument-latest-results-142-highly-innovative-smes-funded-horizon-2020

- **CORES** – with financing under the secong session for the project "Zero Emission Robot-Boat for Coastal and Inland Water Monitoring";
- **Comac Medical Ltd.** – with financing under the forth session for the project "Improving diagnostics of respiratory diseases and boosting the COMAC MEDICAL Ltd. competitiveness and growth by validation of fractional EBT biomarker through new method of measurement and device";
- **SCA Development Ltd.** – with financing under the fifth session for the project "MirrorPV – Balanced growth photovoltaic generation with Roof PV mirrors".

Human Capital for Innovation

The staff engaged in R&D together with those engaged in scientific and technological activities measure the human resources directly responsible for the creation, application and dissemination of new knowledge in the field of technologies. The indicator of employment in high-tech sectors reveals the country's specialisation in high innovation activity sectors.

Human Resources in research and innovation

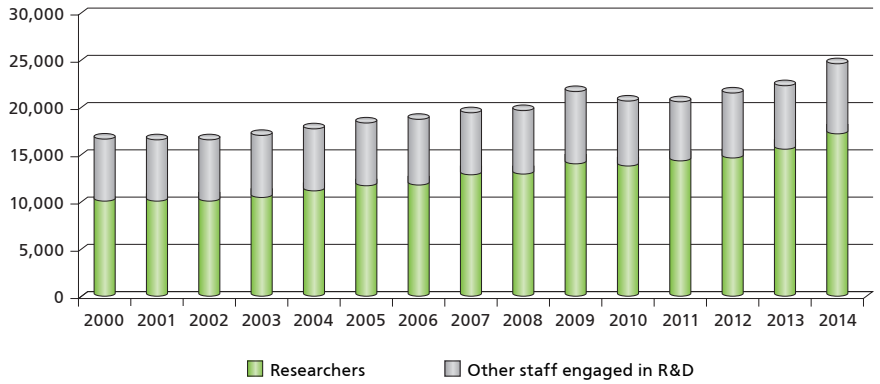
The importance of the business environment and financing are a major precondition for the innovation potential of an economy and the innovation activity of business. However, it is people who generate new ideas, and with their knowledge, competences, skills and motivation they are the factor that determines the success of innovation projects. A growing focus on people supported by relevant initiatives and measures by the developed economies is evident in the changing terms: "human resources – human capital – talent". Understanding talent as the driver of national competitiveness is the reason for the increasing number of research and analyses[33] of the factors supporting or hindering the development, preservation and capitalisation on the basis of talents.

Among the 61 countries in the World Talent Report 2015 of the Institute of Management Development in Switzerland Bulgaria holds the last place and has regressed from the result in the preceding year, including in the indicators investment and development – 54th place; appeal – 60th place; readiness – 60th place. Based on the data presented below, it is not difficult to predict further deterioration of the position.

The increase in R&D spending by 26 % in 2014 leads to a corresponding growth in the number of staff engaged in research and innovation, albeit at a slower pace (12 %). The latter is due mainly to the increased number of technical and support personnel included in the category "Other staff engaged in R&D", and is less pronounced for researchers.

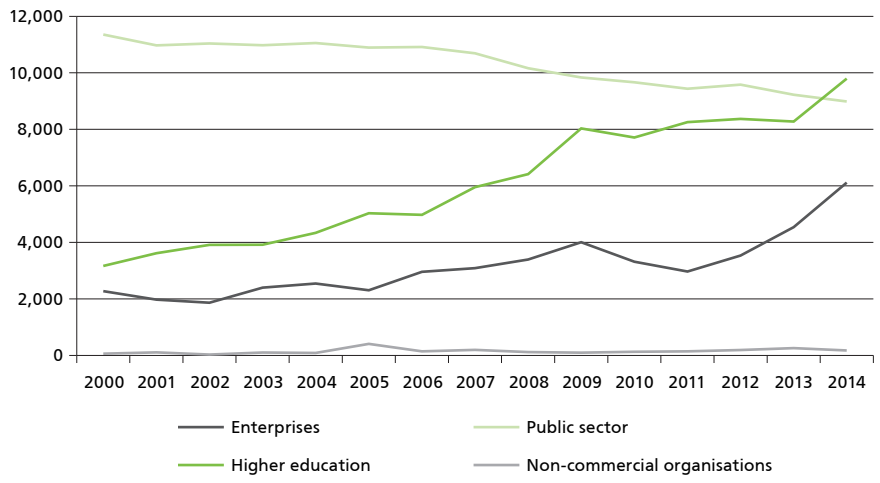
While in some institutional sectors spending and the number of R&D staff rose together, in others they went in opposite directions. The re-

Figure 37. STAFF ENGAGED IN R&D, BY CATEGORY, 2000 – 2014, NUMBER



Source: NSI, 2015.

Figure 38. STAFF ENGAGED IN R&D, BY INSTITUTIONAL SECTOR, 2000 – 2014, NUMBER



Source: NSI, 2015.

[33] INSEAD (2014): The Global Talent Competitiveness Index 2014, Singapore; http://global-indices.insead.edu/gtci/; IMD World Talent Report 2015, Institute for Management Development, 2015; www.imd.org/wcc

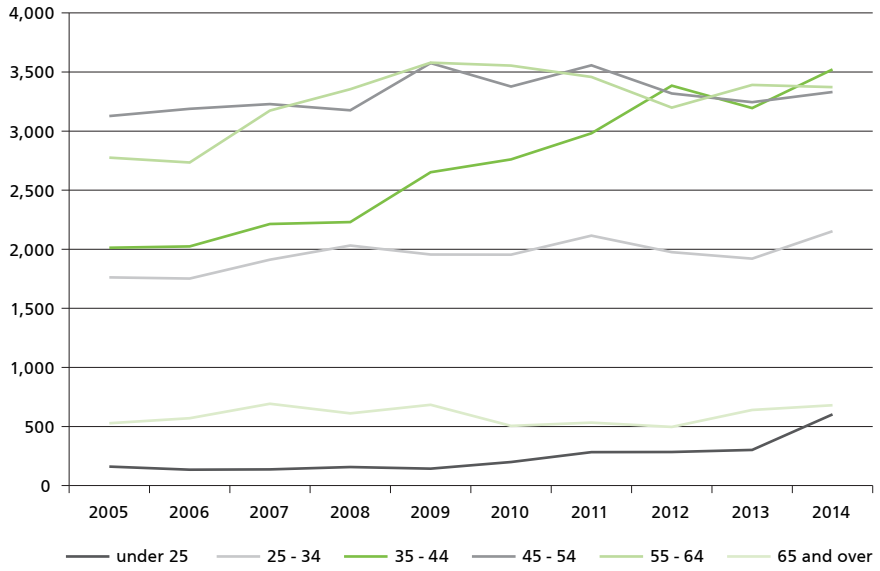
duced number of researchers in the public sector and non-governmental organisations was offset by increases in higher education. **The business sector had the most significant increase in R&D staff since 2000 – some 35 %,** which matched the increase in the spending by enterprises for research and innovation.

Conversely, **against the background of a drastic reduction of the budgets of higher schools for research, the number of their staff engaged in science rose by 18 %**. This could be related to factors other than proper involvement in research. In fact, **academic staff in the higher education sector is engaged almost entirely in teaching and little in university-financed research.** It is obvious that the artificial (not governed by market rationale and social change in the Bulgarian society) inflation of the sector (unjustified number of higher schools, growing number of academic staff) does not lead to qualitative changes such as patent and publication activities and participation in EU research projects.[34] Thus, universities in Bulgaria are little different from secondary schools, mainly having knowledge transfer functions within the learning process and failing to participate in the creation of new research-based knowledge.

With **a leading share of 62 % of researchers, the SWPR ensures highest financing (83 % of total resource in the country) per engaged person in R&D**. Given that the most significant part of spending goes to staff payments, the most undervalued labour is that of researchers in NCPR and NEPR.

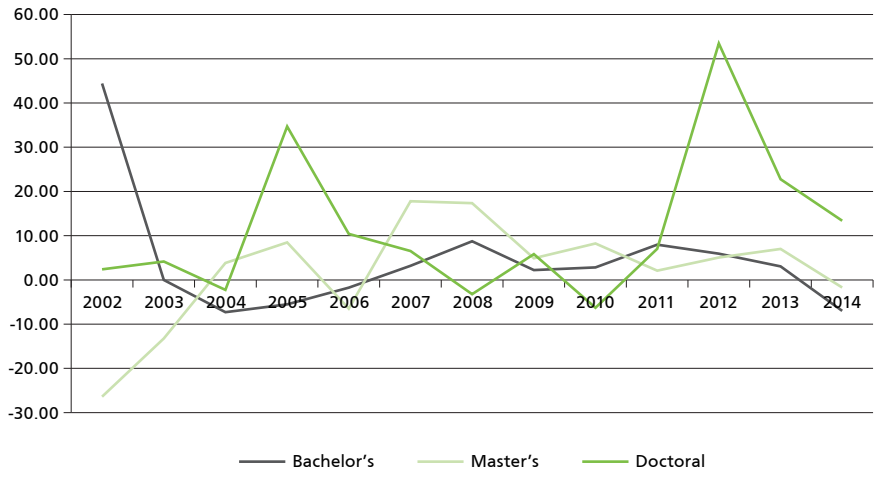
The higher education sector has a more balanced age structure of the R&D staff as compared with the public sector. The lowest share is that of staff under 25 and over 65 years (around 5-6 %); in the other age categories staff shares range from 18 % (from 25 to 34 years old) to 26 % (from 35 to 44 years old).

Figure 39. STAFF ENGAGED IN R&D, BY AGE GROUP, 2005 – 2014, NUMBER



Source: NSI, 2015.

Figure 40. ANNUAL INCREASE OF GRADUATING STUDENTS BY ACADEMIC DEGREE, %



Source: NSI, 2015.

In 2014, **R&D staff under 25 for both sectors doubled** (the biggest increase after 2005) and almost matched the number of staff aged over 65. The retention of this trend may pave the way for a sustained rise in R&D employment in the Bulgarian economy in the future. With an almost equal rate of increase are the employees in the following age categories: 25-34 years old (12 %) and 35-44 years old (10 %), which contributes to a more favourable age structure of R&D staff and reveals young people's interest in pursuing a career in science (the

[34] See more on this in the previous chapters of this report.

reasons for this are an interesting subject for further analyses).

Development of human capital

In 2014, the number of higher education graduates was 60,217, including 54 % bachelors, 44 % masters, and 2 % PhDs. **For the first time in the last seven-year period there was a decline in the number of graduates with bachelor's (-7 %) and master's (-3 %) degrees,** resulting from the steady decline in the number of students in recent years. The number of graduating PhDs continued rising further, albeit at a slower rate (13 %).

STEM[35] **graduates account for a relatively low share in all academic degrees** – 18 % of bachelor's, less than 13 % of master's and merely 23 % those with a doctoral degree. Despite the upward trend in the recent years, in 2014 there was a decline in the interest in those subjects.

After 2000, **the number of foreign students in Bulgaria has increased steadily.** Interest in pursuing a master's degree is even more pronounced and in recent years has offset the decline in the number of foreigners studying for a bachelor's degree. In 2014, students from 70 countries studied in Bulgaria. The country is a popular destination for our two southern neighbours (Turkey and Greece accounted for 27 % and 26 % respectively of the foreign students in 2014), and many students from neighbouring Balkan countries or countries with Bulgarian diaspora come to study here.

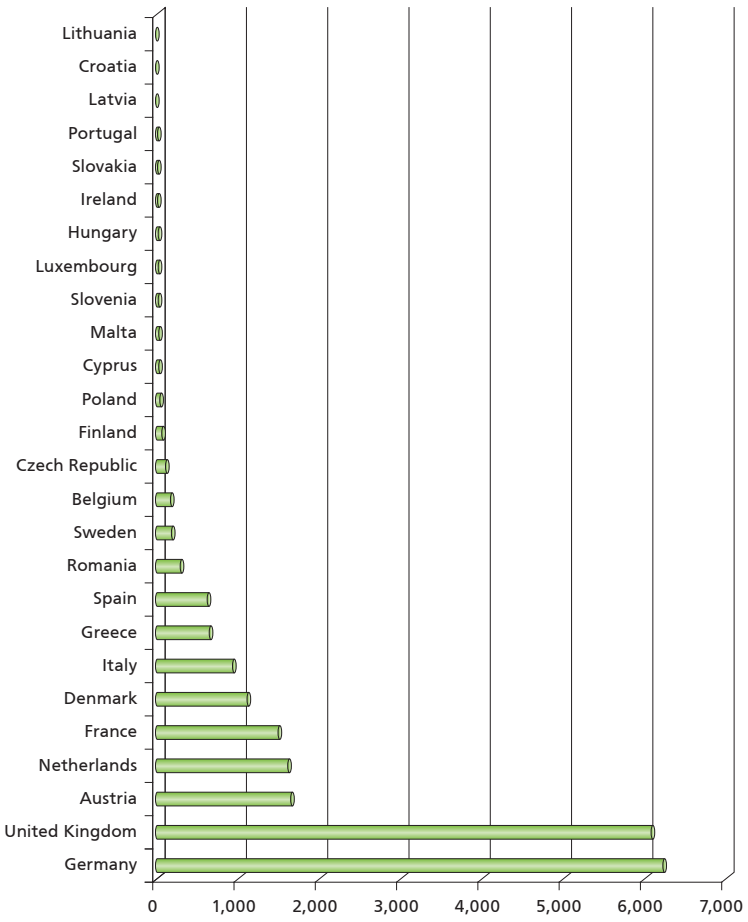
In 2013, about 21,500 Bulgarian students studied in the EU. The most popular destinations were the universities of Germany and the United Kingdom, followed by Austria, the Netherlands and Denmark. In addition, about 1,400 Bulgarian students study in non-EU countries, including Turkey (1,022 students), Switzerland (259), Norway (33) and Macedonia (14).

Table 7. MOBILE STUDENTS STUDYING IN BULGARIA, NUMBER

	Country of graduated previous education	Number of students
1	Turkey	3,094
2	Greece	2,925
3	Ukraine	522
4	Macedonia	507
5	Germany	496
6	United Kingdom	476
7	Cyprus	379
8	Serbia	379
9	Moldova	374
10	Russia	274

Source: NSI, 2015.

Figure 41. BULGARIAN STUDENTS AT FOREIGN UNIVERSITIES BY EU MEMBER STATE, 2013, NUMBER



Source: Eurostat, 2015.

[35] The STEM (Science, Technology, Engineering, and Mathematics) subjects include physical and chemical sciences, mathematics and statistics, informatics, technical sciences and technical professions.

Although this is an estimate (in Bulgaria no institution – not even the Ministry of Education and Science – gathers data and analyses the "brain drain" in the form of students leaving the country), comparing official data on students in Bulgaria and the Eurostat statistics (even without counting the Bulgarian students outside Europe) shows that **the number of Bulgarian students abroad accounts for some 10 % of the number of students studying in Bulgaria**. A major part of them stay on and become employed, thus making Bulgaria a donor of talent (a typical feature of poor countries) to developed countries, voluntarily giving up its most talented and innovative part of human resources. As data in the second edition of the Global Talent Competitiveness Index 2014[36] show, **in the company of 93 countries Bulgaria holds 89th place by "brain drain" and the unenviable 88th place by "brain gain"**.

[36] INSEAD (2014): The Global Talent Competitiveness Index 2014, Singapore; http://global-indices.insead.edu/gtci/

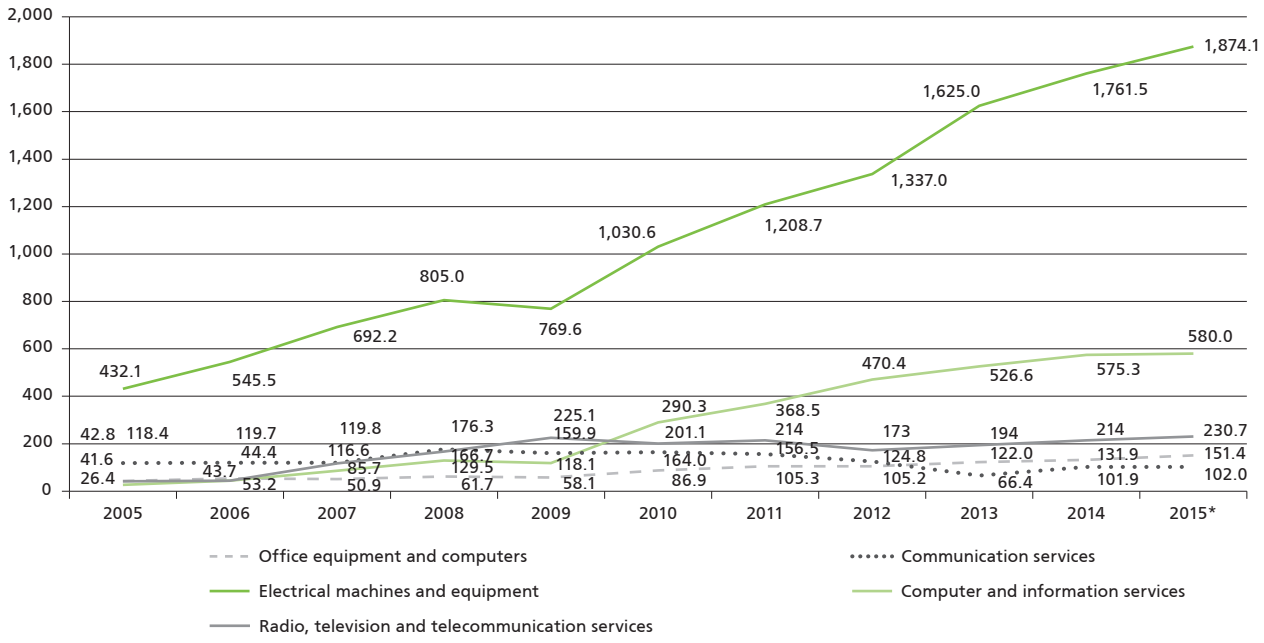
Information and Communication Technologies

The Bulgarian ICT sector continues to be a key source of competitiveness for the economy, already providing 10 % of the country's exports and over 6.5 % of GDP.[37] The forecasts of Applied Research and Communications Fund are that in 2015 the total ICT exports of goods and services will exceed EUR 3 billion. Almost 2/3 of it is exports of electrical appliances and equipment. Companies manufacturing electronics continued to hire new employees and launch new capacities in 2015, which is indicative that the trend will be sustained in 2016.

Export growth of ICT services slowed down in 2015 to 0.7 % against the background of a steady growth of 7 % in exports of industrial production, due mainly to the limited opportunities for employment growth in services as compared to industrial production. In 2015, Bulgaria won the European Outsourcing Association award in the category "Offshoring Destination of the Year" by generating investment in cities other than the capital – mainly Plovdiv, Varna and Bourgas – thus creating expectations for increased employment in this sector. This concerns especially young people who will move to these three destinations from smaller university centres like Shoumen, Veliko Tarnovo, Rousse, Svishtov, and Stara Zagora. However, human potential is very limited both for software outsourcing (software engineers/programmers) and customer service centres (good language skills). Maintaining the positive trend and turning outsourcing into a driver for employment in the Bulgarian regions requires inviting highly qualified specialists from neighbouring counties or though immigration.

The Bulgarian government finally responded to the requests of the ICT business for simplifying the procedure for issuing "EU Blue Card" by adopting a Decree amending and supplementing the Ordinance on the terms and procedure for issuing, denying and revoking work permits of foreigners in Bulgaria, published in

Figure 42. BULGARIAN ICT EXPORTS (2005 – 2015), EUR MILLION



* Data on 2015 are extrapolations based on the period January – August 2015. Since April 2015, the data have been provided in accordance with the IMF Balance of Payments and International Investment Position Manual (IMF, 2008) in the aggregated item "Telecommunications, computer and information services".

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

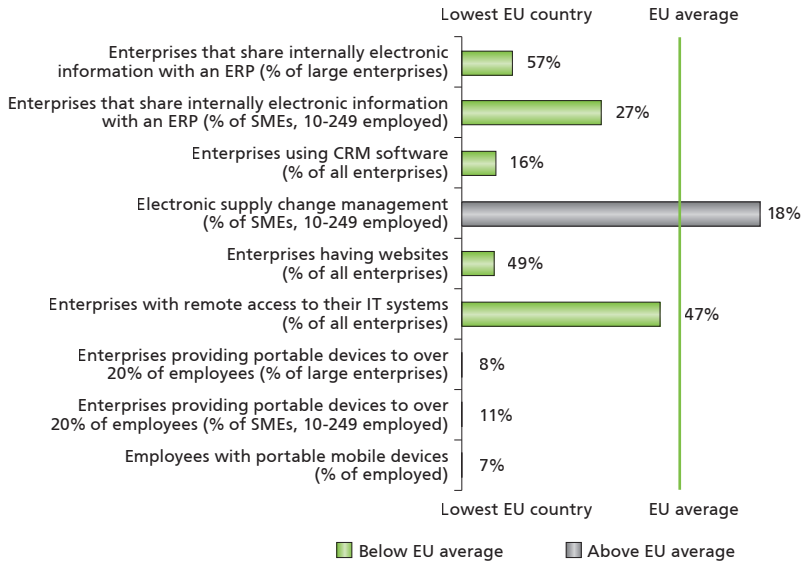
[37] Data on exports are from the Foreign Trade Statistics of Eurostat for the first 8 months of 2015, while the share of ICT in GDP is an estimate of the Applied Research and Communications Fund based on the trends in the share of total export in GDP in the period 2010 – 2014 and the share of ICT export in total export in the period 2010 – August 2015. The latest official data on that share are from 2011.

the State Gazette, No. 80 of 16 October 2015. **The concept paper for creating 30,000 software specialists in Bulgaria** prepared by the government and the ICT associations is also a step in the right direction. Nevertheless, the lack of cross government coordination is apparent in the fact that the updated National Programme Digital Bulgaria 2020 neither refers to such a concept, nor contains any clearly stated objectives and measures for their achievement. Regardless of whether more public funds would be invested in universities and in additional training in private companies and academies (such as the Software University), the low quality of higher education and in particular the inefficient teaching of mathematics and IT will be a serious impediment to the implementation of the concept. The recently adopted Pre-School and School Education Act (SG, No. 79 of 13 October 2015) does not include any provisions for more teaching of foreign languages, mathematics and IT, which suggests that in the next 5-10 years there would hardly be youths better prepared to work in the outsourcing or IT sector.

Unlike ICT services and other sectors of the economy such as machine manufacturing, which face serious barriers to growth not in terms of demand, quality, productivity, etc., but in terms of human potential, it seems there is no such problem in the field of electronics, mainly because of the opportunities to hire low-qualified staff to ensure production volume.

The R&D units in the high-tech sector and in particular in electronics and software production have been increasing and expanding, providing opportunities to a wider range of engineers for global experiences (to work on new products and services that are globally recognisable, to travel and meet with their colleagues from leading research laboratories), and in some niche spheres also opportunities for careers in Bulgarian-owned companies and companies established and managed by Bulgarians but acquired by foreign strategic or portfolio investors.

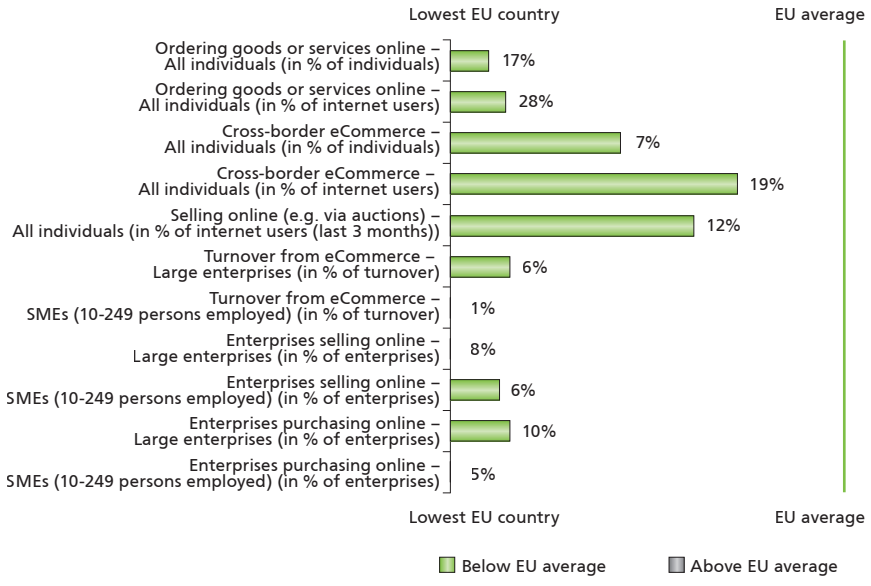
Figure 43. E-BUSINESS PROFILE OF BULGARIAN COMPANIES, 2014



Source: Digital Agenda Scoreboard, 2015.

Among the technologies in the field of e-business used by the Digital Agenda Scoreboard to assess progress, most widely spread in Bulgaria is the use of remote access to corporate IT systems (47 %), although this result is not enough for Bulgaria to catch up with the average European level. Compared with 2014, there was a decline (the previous year it was 58 %), but the trend in the European Union is the same. Probably this involves changes in the sample, at least in the

Figure 44. BULGARIA COUNTRY PROFILE BY E-COMMERCE INDICATOR, 2014



Source: Digital Agenda Scoreboard, 2015.

Bulgarian case, but could be partially due to the growth of some micro companies which did not have such systems in place in 2014 and which had not been included in the sample of the previous survey in 2013.

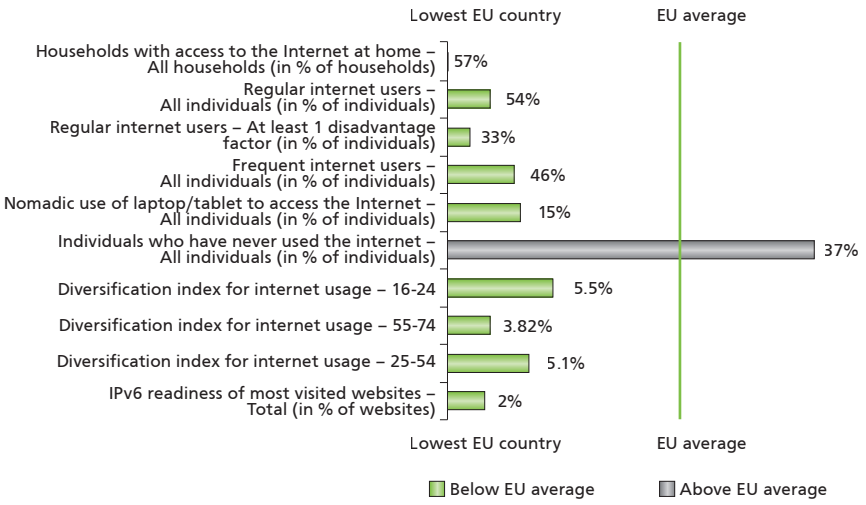
The use of these systems in Bulgaria, however, is below the normal (average) level for the European Union – not only for SMEs but also for large enterprises. There is no integration of the internal processes and there is no systematic approach to customer relationship management (CRM). Nevertheless, there was an improvement on a number of indicators in 2014. Already 16 % (versus 11 % in 2013) of companies use CRM software, 27 % of SMEs (versus 19 % in 2013) and 57 % of large companies have ERP (versus 47 % in 2013). Despite the 2014 growth, the largest lag behind the EU average is in the use of office portable devices (only 7 % of employees – the lowest share in the EU – are provided with such), use of CRM (as an indirect evidence that either the concentration of customers is very high or if they are dispersed they have low bargaining power) and having websites (49 %). Somewhat surprising against this background are the high shares of enterprises managing electronic supply change and using RFID, although this could be explained by the rapid technological advancement of all companies (incl. low-tech sectors such as textiles and manufacturing of wearing apparel) which are part of the international value added chains. The share of companies paying for online advertisement (25 %) is above the average European values but the budgets are certainly very limited. The reason for the increase is mainly the easier management of small budgets for advertisements in Google Adds, YouTube, Facebook etc., not so much via media shops and Bulgarian online media.

Although half of the companies have websites, and half of them pay for online advertisement of their goods and services, only 6 % (SMEs) to 8 % (large companies) actually sell online and the volumes are negligible (1 % of total turnover for SMEs, and 6 % for large companies). Still, 2014 data show an increase in both the share and volume of eCommerce, although Bulgaria is far from the average European levels.

If Bulgarian enterprises do not provide enough products and services at attractive prices, users can reasonably be expected to purchase them from abroad. By this indicator Bulgaria is closest to the average for the European Union – 19 % of internet users shop online from abroad. Group shopping is very popular as it makes the end price cheaper than the price in a store in Bulgaria.

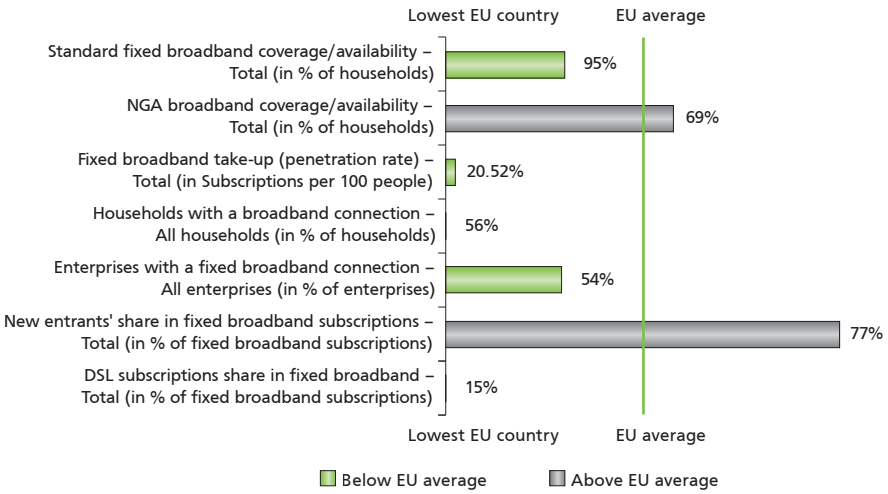
Albeit slowly and often in the grey economy, micro entrepreneurship with handcrafted jewellery, clothes and accessories, gifts and works of

Figure 45. BULGARIA COUNTRY PROFILE BY USE OF INTERNET, 2014



Source: Digital Agenda Scoreboard, 2015.

Figure 46. BULGARIA COUNTRY PROFILE BY BROADBAND TAKE-UP AND COVERAGE INDICATORS, 2014



Source: Digital Agenda Scoreboard, 2015.

art is gaining momentum. These are marketed entirely abroad and online via specialised websites such as etsy.com, eBay or Facebook (orders) and payments are made via PayPal or Western Union. Most probably, the majority of the 7 % who claim to have traded online with foreign counterparts have in fact made purchases. The actual share of the sellers, according to ARC Fund estimates, is rather 0.7 %.

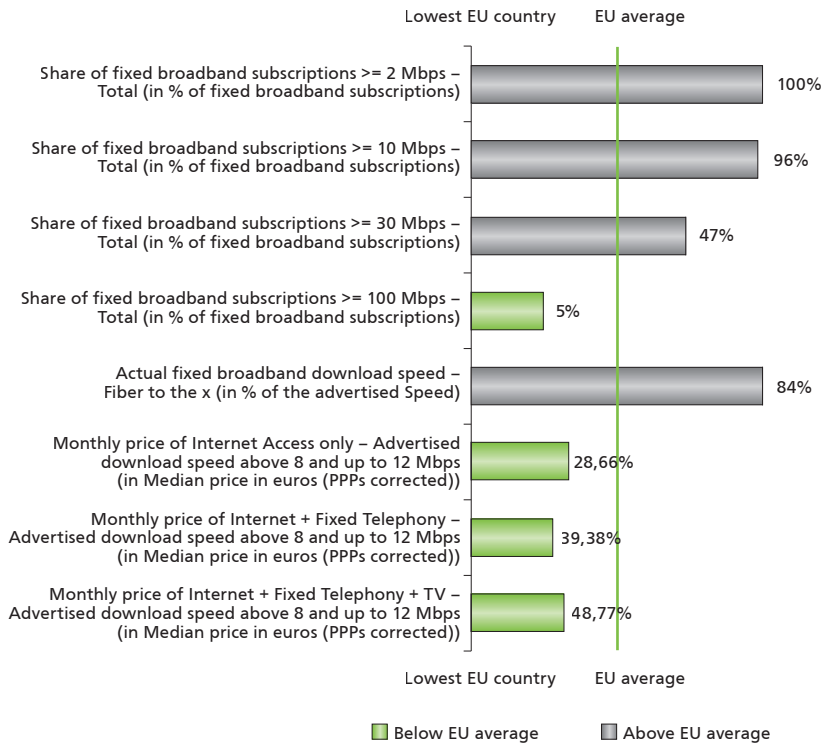
The high share of internet users who claim to have participated in online sales (12 % for 2014), similarly to the survey in 2013, is due to the fact that most of them have considered the publication of an online advertisement as a sale or rent. The drop by 19 % in 2013 is probably due more to users becoming aware of the scope of the term, and less to an actual decline in the publication of online advertisements (incl. in the social media).

Official data on internet use received from sample surveys continue to underestimate access (57 % of households) and use (54 % of the population uses internet on a regular basis) but they come close to the realistic estimates (over 2/3 of households and about 3/4 of the population). The number of people who have never used internet has decreased (37 % in 2014 versus 41 % in 2013). Possibly some of them actually use internet through the applications of their mobile phones but do not consider it "true" internet use via cable and a computer).

The index of diversification of internet use has been gradually increasing, revealing the range of activities (out of a list of 12) performed by users. Naturally, younger people use internet more diversely, including in terms of devices and places of use (always connected, often in more than one way – telephone and tablet/laptop, and they reach more complex use faster (growth of 4.88 versus 5.5 index points in the age group of 16 – 24 years old).

Bulgaria is better developed as compared to the average European levels in terms of infrastructure for next-generation access (NGA) – 69 % coverage, strong competition for some time now (77 % share of new entrants), the share of subscriptions for broadband internet, actual speeds and prices. The country still lags behind in terms of plans for mobile internet and the share of households with broadband internet, but this is due to the underestimated share of internet users. In practice, in Bulgaria there is only broadband internet.

Figure 47. BULGARIA COUNTRY PROFILE BY BROADBAND SPEEDS AND PRICES INDICATORS, 2014



Source: Digital Agenda Scoreboard, 2015.

LITERATURE

Bloomberg Most Innovative Countries 2015, http://www.bloomberg.com/visual-data/best-and-worst//most-innovative-countries

Digital Agenda Scoreboard, 2015.

Global Innovation Index 2015, https://www.globalinnovationindex.org/content/page/GII-Home

Horizon 2020, First results, EC, DG Research and Innovation, 2015; https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/horizon_2020_first_results.pdf

Horizon 2020, Public-Public Partnerships and the link to ERA, https://ec.europa.eu/research/era/pdf/cofund-2014-infoday/1_p2p_horizon_2020.pdf

IMD World Talent Report 2015, Institute for Management Development, 2015; www.imd.org/wcc

Innovation Union Scoreboard 2015, http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en.pdf; http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm.

INSEAD (2014): The Global Talent Competitiveness Index 2014, Singapore; http://global-indices.insead.edu/gtci/; IMD World Talent Report 2015, Institute for Management Development, 2015; www.imd.org/wcc

Peer Review of the Bulgarian Research and Innovation System, Horizon 2020 Policy Support Facility, DG RTD – H2020 Policy Support Facility, September 2015.

Public Consultation „Science 2.0": Science in Transition, Background Document, EC, DG Research & Innovation (RTD) and Communications Networks, Content and Technology (CONNECT), https://ec.europa.eu/research/consultations/science-2.0/background.pdf

Research and Innovation as Sources of Renewed Growth, Brussels, 20.6.2014, COM(2014) 339 final, https://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2013/research-and-innovation-as-sources-of-renewed-growth-com-2014-339-final.pdf

http://ec.europa.eu/finance/capital-markets-union/docs/building-cmu-action-plan_en.pdf

http://era.gv.at/directory/62

https://open-data.europa.eu/en/data

http://thesamewavelength.com/the-century-of-the-generals-and-sustainability/

http://www.cluster-analysis.org

Анализ на клъстерите в България, АБК, 2015.

Бюлетини „Наука и бизнес", 2013.

Георгиева, Р. Институционален анализ на националната патентна активност в България за периода 2001 – 2014.//Сборник доклади на Международна научна конференция на ТУ-Габрово „Унитех 2015", Габрово, 20-21 ноември 2015, с. 179-183. ISSN: 1313-230X.

Иновации.бг 2013, Фондация „Приложни изследвания и комуникации", 2013.

Иновации.бг 2014, Фондация „Приложни изследвания и комуникации", 2014.

Иновационна стратегия за интелигентна специализация, МЕ, 2015.

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Оперативна програма „Иновации и предприемачество", МЕ, 2015.

Оперативна програма „Наука и образование за интелигентен растеж", МОН, 2015.

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- research and analyses of development trends and policy options for supporting innovation as well as information and communication technologies;
- public-private partnerships among businesses, public institutions, the academic community and civil society for addressing specific issues of ICT and innovation based competitiveness.

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