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**THE RESEARCH
AND TECHNOLOGY
DEVELOPMENT IN LITHUANIA
AND THE PROSPECTS
OF RESEARCH AND TECHNOLOGY
COOPERATION BETWEEN
LITHUANIA
AND THE RUSSIAN FEDERATION**

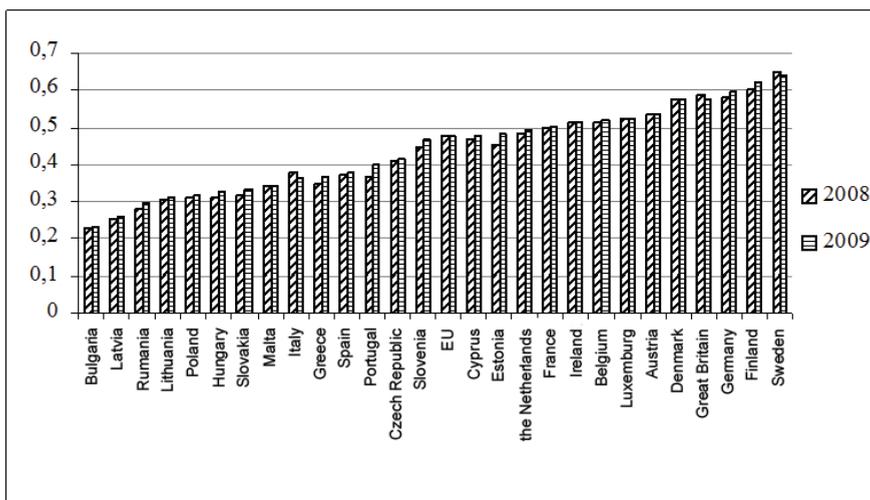
This article focuses on the present state and prospects of research and technology development in Lithuania. The authors focus on the main competitive innovation spheres (information technologies, biotechnologies, special purpose laser technologies) and analyse the principal lines of innovation policy and strategy. The article presents the results of a SWOT analysis of Lithuanian innovation development and describes the possible fields and mechanisms of research and technology cooperation between Lithuania and the Russian Federation.

Key words: Lithuania, Russian Federation, research and technology development, innovation development, innovation policy, innovation strategy.



The intensification of research and technology development and creation of new markets for high-tech products are identified by the government of Lithuania as one of the key tools to overcome the economic crisis and boost the economic recovery of the country.

According to the European Innovation Scoreboard in 2009, among the EU countries the total innovation index of Lithuania is higher than those of Romania, Latvia and Bulgaria [11] (Fig. 1).



Traditional raw materials processing dominates in the industry of the country. Branches of the country's industry where advanced and moderately

advanced technologies are used constitutes only one-fifth of the sales of the Lithuanian extractive and manufacturing industries. In 2006, the share of exports in these sectors accounted for 33.1 % of the total, while the average indicator for the EU is 48,1 % [10].

The leading Lithuanian universities (Vilnius University, Vilnius Gediminas Technical University, Kaunas University of Technology, the Vytautas Magnus University in Kaunas, Klaipeda University, etc.) have good potential in such areas of innovation research as material science and physico-chemical technologies, biomedicine and biotechnologies, engineering and information technology, natural resources and agriculture, etc.

Lithuania ranks first among all EU countries in training highly qualified specialists in the field of information technology (IT) per capita. About 10 thousand experts were employed in software engineering in 2008, and their number has doubled during the last five years [5, p. 44]. There are over one thousand successful IT companies in Lithuania.

Lithuania has a leading position in the field of biotechnology in Central and Eastern Europe (for example, CJSC "Fermentas" is among the five largest companies in the world, and is a market leader in DNA markers in Europe) [4]. There are fifteen biotechnological research centers in Lithuania [3, p. 33] that have achieved good results in chemical and biochemical research of proteins, enzymes and nucleic acids for the pharmaceutical industry, as well as in molecular research of prokaryotic and eukaryotic cells. The medico-pharmaceutical valley, Santariškės Visoriai, the first in the Baltic states was founded in Vilnius in 2007.

The country is one of the world's leaders in the development and production of special purpose laser technologies (50% of the global market for high energy picosecond lasers, 80% of the world production of ultrafast optical parametric oscillators, etc.). At the moment there are more than 10 laser technology companies in Lithuania, which export their products to approximately 100 countries around the world [5, p. 58, 3]. The main research on laser technology is carried out in Kaunas University of Technology and the Vilnius Gediminas Technical University. Laser technology research and development centers in Lithuania implement international projects which are funded by the EU and the NATO.

Lithuania is planning to enter the Green Energy Market. For this purpose a Solar Energy Research and Development Centre is being set up in Visoriai technopark. It is assumed that by the year 2015, the production will account for 170 million dollars. Ninety-five per cent of the solar cells produced will be exported [1].

The gap between the EU and Lithuania in the average R&D expenditures is shrinking. In 1995, the research and development expenditures accounted for 0.46% of the country's GDP compared to 1.8% in the EU 27. In 2008, this ratio was 0.8% to 1.83% [8, p. 8—9] (Fig. 2).

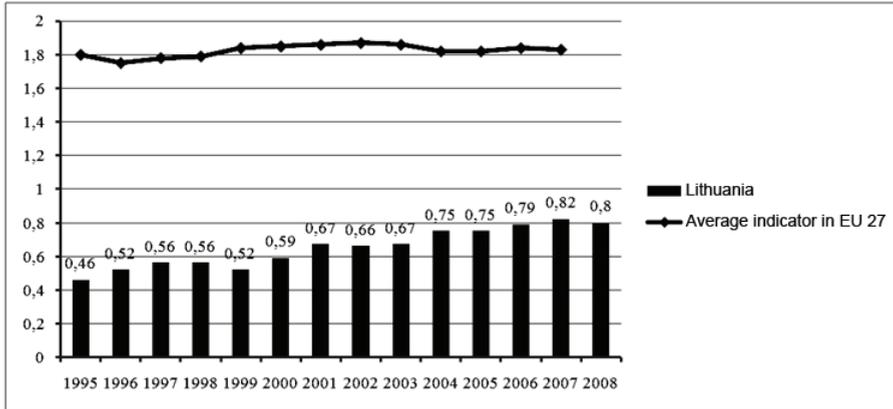


Fig 2. R&D expenditures (% of the GDP)

Source: [8, p. 8].

The number of researchers involved in R&D increased by 1.26 times during the period 2000—2009. [2].

Five complex innovation centers of research, education and business (the so called "valleys") in Vilnius ("Sauletekis", "Santara"), Kaunas ("Santaka", "Neman") and Klaipeda ("Marine") and 10 research and technology parks are to boost innovation development of the Lithuanian republic.

A SWOT-analysis of Lithuania's innovation development, carried out in the course of this research, identified the strengths and weaknesses of the research and technology potential of the country, as well as opportunities for further development and threats that may hinder this development (see table).

SWOT-analysis of innovation development of Lithuania

Strengths	Weaknesses
1. An increase in R&D expenditures and narrowing gap between the corresponding indicators of the EU and Lithuania 2. An increase in the number of employees engaged in R&D 3. Growth in export volumes 4. Close economic relations with the EU member states and the states of the European Economic Area 5. High level of mobility and high competence of staff 6. Tax benefits given to companies investing in R&D and technological modernization 7. Developed IT infrastructure	1. Low number of innovation based enterprises; insufficiency of research and innovation development at industrial enterprises 2. Fragmentation of the education system, the quality of education does not meet the needs of modern life 3. Fragmentation of the system of innovations 4. Fragmentation of the research infrastructure 5. Lack of inter-institutional cooperation

Opportunities	Threats
<ol style="list-style-type: none"> 1. A law on research and education allows solving the issues related to intellectual property 2. Approved joint research programmes will enable the coordination of research development and ensure proper use of the EU structural funds 3. Accelerating the search for alternative energy sources and improving energy efficiency 4. Increased demand for products with high added value 5. Joining the business sector to international clusters will stimulate innovation 6. Financial support from the EU for business innovation for the period 2007—2013 is provided 	<ol style="list-style-type: none"> 1. The "brain drain", which can greatly weaken the competitiveness of Lithuania. 2. A lack of strategic (long term) innovations 3. Political instability and often inconsistent implementation of the adopted policies 4. Strong and fast developing innovation infrastructure, sustainable policy and funding for innovation in the neighboring countries 5. Poor quality of technological development and scientific research, as well as their implementation in business, may worsen the existing problems of enterprises competitiveness and may result in new problems 6. The growth of economic competitiveness and innovation sector in Asia, Brazil, Russia, China and India 7. Decrease in competitiveness of Lithuanian companies 8. Lack of material resources and human resources 9. Lack of entrepreneurial and creative approach in private sector and business 10. Lack of a systematic approach to innovation, low culture of inter-institutional cooperation, tradition of cooperation between business and research

The Innovation Policy of the Lithuanian Republic is based on the following programs and policies:

1. The Lithuanian national Lisbon strategy implementation programme.
2. High technology development programme for 2007—2013.
3. Long-term strategy for research and development for the period up to 2015
4. The conception for the development of research and technology parks.
5. The Lithuanian innovation strategy for the period 2010—2020 [7].

One of the key documents is the Lithuanian innovation strategy for the period 2010—2020, approved by the Government of Lithuania in February 2010. The main objective of the Strategy is to achieve the European average summary index of innovation, which in 2010 in Lithuania was 0.29, while in the EU — 0.47 [11].

The Innovation strategy is based on the National Long-Term Development Strategy, approved on November 12, 2002 by the Seimas of the Republic of Lithuania, and the Lithuanian national Lisbon strategy implementation programme for the period 2008—2010, adopted by the Lithuanian Government on October 1, 2008 [9]. The document identifies

three periods for the implementation of the innovation policy: 2010—2014, 2014—2017, 2017—2020.

The objectives and goals of innovation development of Lithuania are the following ones [9]:

1. A higher level of Lithuania's integration into global markets ("Lithuania without borders").
2. Development of complex research, education and business centers of the international level.
3. Active participation in the creation of the single European Research Area.
4. Joining international innovation networks.
5. Participation in the implementation of international initiatives (the Strategy for the Baltic Sea Region, the activities of the European Space Agency and others).
6. Development of export of services and business internationalization; an increase in the high added value products.
7. Encouraging direct foreign investment into products and services that create high added value.
8. Innovation development in a variety of fields.
9. Promoting technological and non-technological, social and public innovation.
10. Encouraging innovation oriented towards meeting the demands and needs of the consumer.
11. Increased access of small and medium-sized enterprises to various funding sources.
12. The development of effective mechanisms of cooperation between science and education.
13. Implementation of a systematic approach to innovation.
14. Securing inter-institutional coordination when implementing the National innovation strategy.
15. strengthening of interaction among research, education and business.

The most important tools of implementing the innovation strategy of the Republic of Lithuania are the following ones:

1. The development of complex research, education and business centers of the international level by means of raising the quality of training programmes (bachelor and master's programmes), the training of trainers, staff and students' mobility. Five projects aimed at the creation of the so-called "valleys", the setting up of new centres, or modernization of the existing R&D centers are to be implemented during the period 2010—2013.
2. Integration of the business community into the international innovation networks by encouraging the participation of enterprises in the international innovation support and technology transfer networks; financial support for the implementation of innovation projects.
3. Participation in the implementation of international initiatives.
4. The growth in the number of high added value products, the development of export of services; business internationalization.
5. Increasing investment in the innovation, technological, non-technological, social and public spheres.



6. The development of effective mechanisms for cooperation between science and business.

7. The formation of a systematic approach to innovation.

On October 24, 2006 the Government of the Republic of Lithuania approved the "Programme of the development of high technology for 2007—2013". Its development priorities are the following ones: biotechnology, mechatronics, laser technologies, information technology, nanotechnology, and electronics.

The research and educational institutions of Lithuania have gained experience that can be borrowed by Russia in more than 30 fields; this exchange of best practices can play a significant role in the development of cooperation between Russia and Lithuania. Technology exchange can occur in the following fields: laser technology and optical equipment, new materials and chemical products, fertilizers and petrochemicals, timber, woodworking and living systems technologies, transportation, fuel and energy, ecology and environmental management. Given the current political situation and gradually improving relations between the governments of Russia and Lithuania, one can predict that the process of cooperation in the field of technology and innovation will eventually be intensified.

The Agreement between the Governments of the Russian Federation and the Republic of Lithuania on Cooperation in Science and Technology may become an effective mechanism for the regulation of such interstate cooperation in research and technology. The draft of this agreement is proposed in the framework of this research. A joint Russia — Lithuania committee on "Cooperation in Research and Technology" could coordinate cooperation in the framework of the proposed draft agreement. The committee could include representatives of the state and local public authorities from both countries, heads of higher education institutions of Lithuania and the North-West of Russia, the management teams of innovation business structures, as well as chairmen of the business associations, etc.

The new forms of international integration such as large regions, growth triangles, megacorridors, trans-border coastal zones, Scandinavian groups, Euroregions, development corridors, trans-border industrial districts, trans-border clusters, polycentric cross-border bridges between regions, could also be used to implement innovations and establish trans-border international cooperation in the sphere of innovation. Currently the innovation is not a top priority in trans-border cooperation, but its importance is increasing. It is innovation that can ensure the establishment of effective networks of research and education institutions, technology parks, innovation parks, research and business institutions, and government bodies.

It is necessary to develop and adopt a joint strategy for trans-border cooperation between Russia and the European Union at the level of border regions to foster further development of cross-border cooperation. The issue of innovation should be one of the drivers of this strategy.

An example of a project aimed at developing cooperation in innovation, is the project the "Establishment of a bipolar research area Klaipeda — Kaliningrad", carried out in 2007—2009 in the framework of the Neighbourhood Programme "Lithuania — Poland — Kaliningrad region of Russia." The project partners were the Immanuel Kant State University of Russia, Klaipeda University and Klaipeda County Governor's Administration.

The aim was to create an infrastructure for long-term development of research and innovation potential of the Klaipėda County of Lithuania and the Kaliningrad region of Russia with the support of young scientists and to strengthen trans-border research cooperation and networking. The project created links between the innovation park of the Immanuel Kant State University of Russia and the technopark in Klaipėda, as well as between groups of scientists, who launched new joint projects in the framework of the programme of cross-border cooperation "Lithuania — Poland — Russia" for years 2007—2013.

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