

Research & Development in Information and Communication Technologies in Lithuania

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Abstract. The paper investigates the current status, successful aspects and problems, needed future changes in Lithuanian ICT sector, research and development, and R&D in ICT.

1. European factors of ICT R&D in Lithuania

Lithuania as a new member state of European Union runs a number of programmes in accordance to EU requirements.

Socioeconomic changes in Central and Eastern Europe have clearly positive impact on the ICT R&D community: availability of EU structural funds, participation in FP6 projects, the “push” of Lisbon strategy – strengthen Lithuanian ICT R&D capacities.

2. Lithuanian ICT sector

A review of the general economic and social situation in Lithuania is presented in [Kazl-06]. General statistics about Lithuanian ICT sector are presented in the report [Stat-05]; Lithuanian ICT potential is summarised in [Gora-05]. Comparison of key ICT indicators with an average of the EU Member States is given in Table 1.

Table 1. Comparison of key ICT indicators 2004 with an average of the EU Member States [NLIP-05]

Indicator being analysed	Indicator unit	Value (Lithuania)	Value (EU average)	Non-uniformity level
Permanent internet users	Citizens of the country using internet at least once per week, %	26	39	Medium
Household internet	Internet in household, %	12	42	High
Subscribers using broadband communication technology	Households using broadband communication technology, %	4	15	High
Level of public electronic services	Basic public services, reached by the Internet, %	59	72	Medium
Public mobile telephone subscribers	Number of public mobile telephone subscribers per 100 citizens, %	79	83	Low

The Lithuanian ICT Sector is mostly private and in 2004 consisted of around 1000 IT companies employing around 30 thousand people. Historically most of the IT companies have been established by the State and University computing centres that evolved in 1980-1990. Mostly these are small-sized companies with 2-20 programmers, very few have over 100 employed specialists.

The intensification of the application of scientific research results and the integration of the resources of scientists and IT specialists in mastering the most recent information technologies as well as increasing production and exports, should become impulses accelerating this process.

In comparison to the previous year the prices of information and communication technologies products increased by 7.6 per cent and the relative weight of the gross national output the ICT products have grown from 4.5 % in 2002 to 5.3 % 2003. ICT sector generates 3.5 % of GDP and an increasing number of companies is providing relevant services.

The SWOT analysis of Lithuanian ICT industry is presented in Table 2.

Table 2. SWOT analysis of Lithuanian ICT industry [ITC-02]

<p>Strengths</p> <ul style="list-style-type: none"> • Human factor suitable for innovative activity and knowledge-based production; • Healthy economy, growing most rapidly among the CEE (5-6% for 2001-2005); • Well-developed IT universities producing over 500 specialists in IT and other disciplines annually; • Well-trained & low-cost human resources available; • Modern telecom infrastructure with a digitalisation ratio of 100% and mobile penetration of 95%; • Versatile in English, Russian, German and Polish; • Open economy with rule-based system aligned to the EU & WTO – economic stability; • Developed financial institutions & intermediaries; • Location between the EU, Nordics, Belarus & Russia; • Capacity to promptly adapt to rapidly changing IT & knowledge based economy; • Privatization accomplished; industry re-structured based on comparative advantages; • Institutional support to SME development; • Well developed IT infrastructure across the region; • Sound linkage between academia and industry for development applications; • EU and NATO integration to provide large market opportunities for IT-enabled services. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Manpower adequately skilled but needs re-training on project management and quality management of IT projects; • Delay in drafting and implementation strategies of IT policy; • Vague long-term vision for ICT development including action plans or prioritization of funds; • Comparatively small market - small investment by MNCs; • Foreign economic relations not formulated on the basis of national interests; • Capital market in the development stage; • IT penetration not sufficient to boost e-Commerce and e-Business development yet; • Logistics management poor - railway transport system physically deteriorating; • Public-private partnership weak & cooperation among economic entities under-developed; • Not much of incentives for R&D by business.
<p>Opportunities</p> <ul style="list-style-type: none"> • Development of labour-intensive sector like informatics and knowledge-based economy to serve a larger market of EU and CIS; • Availability of structural funds consequent to the EU accession to provide support to business, employment promotion, improvement in quality of life, etc.; • Industrialization processes based on FDI, advanced technology and international management experience to enhance competitiveness and leverage advantages to achieve export-led growth.; • EU accession to expand sales markets and provide preconditions for buoyancy of foreign trade; • Globalization of financial resources will provide alternative possibilities for financial resource building; • Use of digital space will open wider markets and provide conditions for more efficient cooperation with better advanced economies for IT, offshore development, R&D and IT enabled services; • Possibility to establish position in the transport service market of continental Europe, founding logistic centres in Kaunas, Klaipeda and Vilnius; • Free movement of IT personnel to provide opportunities for application development and onshore software development. 	<p>Threats</p> <ul style="list-style-type: none"> • Intellectual outflow to weaken intellectual potential of Lithuania; • Fear of closure of domestic IT companies due to fierce competition unless they develop niche markets; • Fear of becoming a centre of high cost production because of alignment to the EU and distortion in trade from third countries; • Loss of General Preference Systems discounts for exports to US, Canada and Japan; • International environmental obligations may lead to high costs of production and other factors; • Advanced IT countries may treat Lithuania as consumers and not as developers/partners for modern products and services thereby leaving Lithuania as a backward IT state; • Lack of coherent image of industry; • Inconsistent policies and lack of critical communication may lead to fragmented growth of IT industry.

The Lithuanian mobile network service providers are especially active in the ICT sector. Overall, recently the prices for electronic communications services to Lithuanian subscribers were decreasing steadily and were lowest in Europe. Last year, prices for the mobile telephone services amounted to 37 – 65% of the EU average. The mobile network penetration rate is one of highest in the world. The final introduction of services allowing transfer of a mobile telephone number to another mobile phone set has further spurred competition between the providers of mobile network services.

Lithuania is also successful in meeting the challenge of the broadband links. The implementation programme of the Rural Area Broadband Interconnection to Network (RAIN)¹ financed by the EU has received much attention last year. Fibre-optic cables of 3.000 km in total length are to connect rural areas; a total of 410 local administrations and their inhabitants are to be joined by a single broadband network. The International Telecommunications Union has listed this project in the Golden book of the World Summit on the Information Society (WSIS) covering the major global Information Society projects.

ICT priorities were defined in the “*Conceptual Framework of the National Information Society Development in Lithuania*”, approved by the Government [GRL-01]. Following this line, the “Strategy of Information Society Development in Lithuania” was approved by the Government in 2005. It formulates the most important state goals for ensuring the Information Society development in Lithuania.

3. Academic R&D in Lithuania

The Higher Education and research system in Lithuania is based on the “Law on Research and Higher Education”, adopted in 1991 and amended in 2002 [LRHE-91]. Coordination of the main activities in R&D is accomplished by governmental decrees. The policy of research is formed and implemented by the Ministry of Education and Science in collaboration with the Science Council of Lithuania. The Science Council of Lithuania is the main scientific expert by the Seimas (Parliament) and the Government of the Republic of Lithuania on issues of organizing and financing of research and higher education.

Lithuanian academic R&D system consists of 15 state universities, 17 state research institutes, 18 university research institutes, and 8 state research establishments:

- In order to ensure the quality of studies, one third of research and experimental development research is carried out at *universities*.
- *University research institutes* carry out research of high international quality. They focus mainly on basic research and provide the research basis for university education and doctoral studies.
- *State research institutes* established to carry out long-term research of international quality important for the Lithuanian economy, culture and international cooperation: research involving groups of specialized scientists and requiring data collection and specialized experimental instruments. Guidelines for research are provided by the Ministry of Higher Education and Science.
- *State research establishments* focus on carrying out applied research and experimental development activities important for the Lithuanian economy, culture and development of industry.

The directory of all Lithuanian academic Research and Development institutions with indication of the main fields of their R&D activities is presented in [MES-06].

¹ <http://www.rain.lt/>

The system of research financing in Lithuania is regulated and managed by the Ministry of Education and Science and the Ministry of Economy.

4. Peculiarities of Research and Development in Lithuania

In 2003 the Lithuanian Government approved the “Long-term strategy of scientific research and experimental development” until year 2015 [LSRD-2003]. The main goal formulated in the strategy is to strengthen the scientific-technological potential of Lithuania and to direct it towards promoting country’s progress and competitiveness, taking into account limited resources. The strategy defines priority to scientific research related to the economy branches, where country’s economical progress and social welfare can be observed already now, first of all to scientific research for developing high technology production, and also to the research trends considered of high priority by the EU.

“Programme of Development of High Technologies” was founded by the Government of the Republic of Lithuania and defines tender-based financing principles for R&D in the priority trends for years 2003-2006, and recently approved by the Government for years 2007-2013 [PDHT-06]. It is managed by the Lithuanian State Science and Study Foundation. The goal of the Programme of Development of High Technologies is to develop already existing perspective high technology industry branches in Lithuania: biotechnology, mechatronics, laser technologies, *information technologies*, nanotechnologies and electronics. These branches were selected, because there are already positive results in these areas, they correspond to EU priorities and they cover the most perspective part of the country economy.

Comparison of key R&D indicators with the average of the EU Member States is given in Table 3.

Table 3. Comparison of key R&D indicators with the average of the EU Member States [NLIP-05]

Indicator	Year	Lithuania	EU average	Non-uniformity level
Approximated innovation index -SII (scores)	2004	0.26	0.44*	High
Total investment level to R&D (GDP%), out of them:		0.68	1.94	High
Public sector funds	2003	0.54	0.67	High
Business sector funds	2003	0.14	1.27	High
Number of investigators per thousand of workforce	2003	4.0	5.68**	High
Percentage of companies in business, %	2004	6.7	49.7**	High
Number of employees engaged in the industry of high and medium-high tech (percent out of total number of employees)	2004	3.03	6.60	High
Number of employees engaged in the service sector of high tech (percent out of total number of employees)	2003	1.66	3.19	High
Number of requests submitted to the European Patent Office per 1 million of citizens (units)	2003	2.6	133.6	High
Number of the requests submitted to the USA Patent Office per 1 million of citizens (units)	2002	0.5	59.9	High

* EU –indicator 15; ** 2002

Overall expenditures on R&D 2004 in total were 472,7 mln Lt (i.e. 137 mln €): 63,1 % - from governmental sources, 19,9 % - from business, 10,7 % - from foreign investments, 6 % - from higher education, 0,3 % - from private non-commercial enterprises [Bubl-06].

The assessment of the current situation allows for a statement that the Lithuanian R&D system lags behind the system of the leading EU Member States [NLSIP-05]. It is related to these basic issues:

- The major part of research and technological development (both applied and fundamental) is financed from the Lithuanian State Budget. Practically, all the funds are allocated to state institutions of science and studies applying the technique that considers the quantitative indicators of the last few years (i.e. R&D projects – strictly checked for accordance to Frascati Manual requirements [FraM-02], patents, the number of research publications in respected journals, etc.).
- For national programmes including priority research directions, and for other research carried out under the programme financing selected through the tender process, a minor part (less than 10 %) from the State Budget is allocated.
- R&D results of the science and study systems of Lithuania are not sufficiently used in the business sector because the trends of scientific research are poorly related to business development and demand.
- The system of science and study does not sufficiently react to the state needs for long-term development, the amount of high qualification specialists conforming to the demand of modern industry and business proves insufficient.
- Integration of research and business is problematic because the amount of entrepreneurs in Lithuania is small (2.5 %; while in Western Europe 15 %, in USA 25 %).
- Business investments to R&D are small and the promotion to do it is insufficient (Lithuanian Computer Society², Infobalt Association³, Knowledge Economy Forum⁴ helps solving this problem organising conferences [KEEH-06], distributing information material [KEF-06]).
- Lack of diverse instruments supporting R&D which are available in advanced countries.
- Aging of researchers and brain drain.
- Higher schools and institutions of scientific research practically do not generate new innovative companies.

Lithuanian gross domestic expenditure on R&D was 0,76 % on 2004, and it is planned that until 2010 it should become 2% [Lith-06].

5. Lithuanian ICT R&D current status, problems and future prospects

ICT and Information Society development are among the R&D priorities, approved by the Government of Lithuania, and reflected in the scope of current research programmes. Unfortunately, there is some lack of central coordinating institution of ICT R&D in Lithuania, because different governing bodies are responsible for different aspects of Information Society, ICT development:

- Knowledge Society Council under the President of Lithuania and Information Society Development Committee of the Parliament of the Republic of Lithuania: both with recommendation power;
- *Information Society Development Committee under the Government*⁵: continues partially activities of closed *Ministry of Communications and Informatics*, but has not sufficient capacities and rather small coordinating influence;

² <http://www.liks.lt>

³ <http://www.infobalt.lt>

⁴ <http://www.zef.lt>

⁵ <http://www.ivpk.lt>

- *Ministry of the Interior*⁶: e-Government, infrastructure, information security; *Ministry of Transport and Communication*⁷: communication technologies;
- *Ministry of Economy*⁸: R&D in companies, including ICT, National Technology Platforms [NTP-06];
- *Ministry of Education and Science*⁹: academic R&D, including ICT; *Lithuanian Science Council*¹⁰: proposals to Government on science and studies financing policy and structural reforms,
- *Ministry of Finances*¹¹: managing and paying authority of EU Structural Funds; *Central Project Management Agency*¹²: implementing agency of Infrastructure projects of EU Structural Funds and PHARE projects; *Support Foundation European Social Fund Agency*¹³: implementing agency of human resource projects of EU Structural Funds.
- *Agency for International Science and Technology Development Programmes in Lithuania*¹⁴: EUREKA, COST, 6FP-7FP international projects.

On December 22, 2003 the Lithuanian Government approved the “Long-term strategy of scientific research and experimental development” until year 2015 (decision No. 1646). Pursuing the goals of implementation of the “Long-term strategy of scientific research and experimental development” and of the development of the R&D priority trends, the Government of Lithuania approved 2 programs: “Programme of Development of High Technologies” and “Support to Priority Research and Experimental Development trends in Lithuania”. ICT research falls under the R&D priority “Research to promote a knowledge-based society”, mainly under the trends of IT development and Information Society technologies. Detailed layout of these trends in the above mentioned programmes, includes “mobile information system design”, “design of integrated multimedia, internet and mobile systems”, “development of e-business technologies”, etc.

An attempt to establish ICT R&D financing priorities was made in 2001 approving the “National Concept of Development of the Information Society”. Later on the same year the “Strategic Plan for the Development of the Information Society for the period of 2001-2004” was approved by the Government. This plan identified four priority areas, e-business one of them. Following this line, the “Strategy of Information Society Development in Lithuania” was approved by the Government on June 8, 2005 (decision No. 652). This strategy formulates the most important state goals for ensuring the Information Society development in Lithuania: vision, priorities, goals are formulated, model for the implementation and supervision of the strategy is presented.

Lithuania’s participation in EU R&D framework programs is constantly growing with each new framework programme. Agency for International Science and Technology Development Programmes in Lithuania was established by Governmental Decree under the Ministry of Science and Education in 2002, and is responsible for administration and coordination of the EU Sixth Framework Programme, EURATOM, Security Research Programme, EUREKA, COST as well as other programmes and activities in Lithuania related to international science, research and technology development. The Agency also participates in science, technology and innovation policy formulation, plays an active role in offering proposals to the Lithuanian legislation to facilitate and strengthen Lithuania’s participation in international programmes for R&D. The Agency works to

6 <http://www.vrm.lt>

7 <http://www.transp.lt>

8 <http://www.ukmin.lt>

9 <http://www.smm.lt>

10 <http://www.lmt.lt>

11 <http://www.finmin.lt>

12 <http://www.cpva.lt>

13 <http://www.esf.lt>

14 <http://www.tpa.lt>

ensure cooperation between academic and industrial communities by promoting participation in EU research and technology development projects as well as promotion of science and research activities to the public at large.

Becoming an EU Member State on 1st May 2004 created possibility for Lithuania to fully benefit from European Structural Funds and Cohesion Fund. The Single Programming Document has been designed as a programming document for EU Structural funds in Lithuania for programming period 2004-2006.

National research strategy is aligned with the EU policies, Lisbon strategy and ERA concepts as far as four main aspects are concerned [Vitk-05]:

- Financing – goal to create a more favourable environment for private investments in R&D, application of certain taxation policy, risk capital and EU funds;
- Research objectives – Lithuanian R&D strategy is following the priorities of the European Framework Programmes;
- International cooperation – tendency towards R&D internationalisation, design of Europe excellence centres for selected R&D trends;
- National research activities management – it is stated, that integration into ERA will allow to inherit the best European R&D management principles.

National ICT R&D coordination activities could be improved based on cooperation, exchange of experience with similar institutions in other European countries (e.g. using experience of CISTRANA participants developing ICT R&D programmes [Uoti-05]; other relevant experience of European colleagues (see: [CPW-05], [ISTAG-06], [ECVC-06], etc.). The recommendations of Aho Group Report "Creating an Innovative Europe" [Aho-06] should be taken into consideration in Lithuania, too.

ICT Research & Development shows up in ICT innovations, national and international ICT R&D projects, national and international conferences ([WITF-03], [NBC-05], [ACIT-06], [IIC-06], etc.).

In the future it is needed [Bubl-06]:

- To reorganize the governance and the funding system of R&D:
 - to introduce tender- and programme-based funding system for research,
 - to fund the most important developments both in high-level research (Centres of excellence) and in co-operation with research and industry,
 - to implement a new system of grants for young scientists,
 - to restructure Science Council of Lithuania into a Research Council;
- To facilitate the co-operation of science and industry:
 - to introduce different support instruments for enterprises investing into research,
 - to promote researchers to get involved into consultancy for industry;
- To renovate the infrastructure of research and studies institutions:
 - to concentrate investment into particular research centres (alleviating the over-inflated burden of required excessive reporting - even on trivialities - in EU structural fund projects),
 - to identify the strategic research investment projects,
 - Sunrise Valley, Visoriai Informatikon Technology Park in Vilnius, similar entities in Kaunas and Klaipeda regions.

6. Conclusion

Taking into consideration all the aspects presented in this paper, it could be stated that current situation of Lithuanian Research and Development in Information and Communication Technologies has various problems, but the future prospects are rather promising.

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