

INNO-Policy TrendChart - Policy Trends and Appraisal Report

LITHUANIA

2008

PREFACE

Innovation is a priority of all Member States and of the European Commission. Throughout Europe, hundreds of policy measures and support schemes aimed at innovation have been implemented or are under preparation. The diversity of these measures and schemes reflects the diversity of the framework conditions, cultural preferences and political priorities in the Member States.

PRO INNO Europe is a new initiative of Directorate General Enterprise and Industry which aims to become the focal point for innovation policy analysis, learning and development in Europe, with the view to learning from the best and contributing to the development of new and better innovation policies in Europe. Run by the Innovation Policy Directorate of DG Enterprise and Industry, it pursues the collection, regular updating and analysis of information on innovation policies at national and European level.

The **INNO-Policy TrendChart** serves the “open policy coordination approach” laid down by the Lisbon Council in March 2000. It supports organisation and scheme managers in Europe with summarised and concise information and statistics on innovation policies, performances and trends in the European Union (EU). It is also a European forum for benchmarking and the exchange of good practices in the area of innovation policy.

The INNO-Policy TrendChart products

The INNO-Policy TrendChart, previously TrendChart on Innovation, has been running since January 2000. It now tracks innovation policy developments in all 27 EU Member States, plus Iceland, Norway, Switzerland, Croatia, Turkey, Israel, Brazil, Canada, China, Japan, USA and India. The INNO-Policy TrendChart website¹ provides access to the following services and publications, as they become available:

- a database of innovation policy measures across 39 countries;
- a news service and related innovation policy information database;
- a “who’s who” of agencies and government departments involved in innovation;
- annual policy monitoring reports for all countries covered;
- an appraisal of the Lisbon National Reform Programme (NRP) and innovation by Member State (new separate publication in 2008)
- an annual synthesis report bringing together key points in the INNO-Policy TrendChart.

This document has been prepared within the framework of an initiative of the European Commission’s Enterprise and Industry Directorate-General, Innovation Policy Development Unit. Official responsible: Cesar Santos (cesar.santos@ec.Europa.eu).

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The report covers the period September 2007 – September 2008. This year’s report provides an overview and analyses on two focus themes: 1) Policies in support of creativity and Innovation, 2) Support of innovative start-ups including gazelles.

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¹ See <http://www.proinno-€ope.eu/index.cfm?fuseaction=page.display&topicID=52&parentID=52>

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Executive Summary

1. Introduction: Main recent trends in the National Innovation System

At the end of 2007, the fast-growing Lithuanian economy started showing signs of deceleration. Although the GDP growth remained high with 8.8% in 2007, the forecasts for the 2008 and 2009 are related to the dropdowns to approx. 6 - 6.5% annual growth. Domestically-oriented sectors such as agriculture, construction, internal trade and transport, communications and storage were the most important drivers behind economic expansion. However, the internal market is already cooling due to the stagnating real estate and construction sectors what will have an adverse effect on production and sales of construction materials, furniture (which is an important Lithuanian specialisation among EU) and domestic appliances. Export prospects are more uncertain than domestic factors. Shrinking growth in Latvia and Estonia, two key trade partners, will have a negative effect on the Lithuanian economy. On the other hand, hard times in Western and neighbouring economies will be offset by vigorous demand from CIS markets, especially Russia and Ukraine (SNG countries made 25% of total Lithuanian export markets in 2007, while the EU – over 60 per cent).

The unemployment rate dropped to 4.3% in 2007, compared to 5.6% in 2006, and 11.4% in 2004 – the year of EU accession. It is expected to stabilise in 2008, which would be in favour of industry and business.

In the first months of 2008, year-on-year inflation shot up as high as 10%. The main drivers were higher prices for imported natural gas and household gas, increases in excise duties for fuel and alcoholic beverages and a further climb in global oil prices. The closure of the second reactor at the Ignalina nuclear power plant will lead to the subsequent rise in electricity prices. In 2008, inflation was also supported by income policy: a cut in the personal income tax rate from 27 to 24% and an increase in the minimum monthly wage from LTL 700 (Eur202.9) to LTL 800 (Eur 231.9). Wages continue growing at a rapid rate. In the fourth quarter of 2007, gross remuneration was up by 18.5% year-on-year, or more than twice as fast as the increase in labour productivity, which was still at the 45.8% of the EU 15 level in 2006. In addition, according to the latest estimations, LTL 2.9 milliard (nearly 3% of GDP), were sent back into Lithuanian economy by Lithuanian emigrants, which also kept the internal consumption high.

Innovation performance has not changed significantly during the same period, although Lithuania is already finalising the first EU SF implementation period of 2004-2006. Compared to other European Countries, Lithuania remains among the catching up countries with the SII 0.27, although improvement is approached. The general strengths of Lithuanian national innovation system lies in the well developed and continuing its academic tradition higher education sector with strong science and technology research tradition and engineering orientation. This result in relatively high share of population with tertiary education (26.8%), high numbers of S&T graduates among them (18.9%), and high enrolment of youth (88.2%). However, low participation in lifelong learning (4.9%) leads to obsolete qualifications, actually not suitable for high skill work. The weak links between business and higher education and R&D communities result not only in obsolete qualifications of the highly educated labour force, but also in low value added innovations, developed without input from the R&D sector. Although the linking and technology transfer institutions are in place, due to the lack of endogenous R&D capacities, both, in public, and in business sector they are not able to bring significant changes. Therefore in terms of NIS development Lithuania is facing a major challenge in converting its innovation inputs into outputs, in terms of knowledge applications and intellectual property. The number of innovative enterprises (CIS IV) remained low (18.4%) however their turnover made up 52.3 % of total turnover of Lithuanian enterprises. As the companies face competition pressure related to the increasing energy costs, labour shortages and growth of wages, we can expect the more active search for innovations, as a source of non cost based competitiveness, and consequently – increase of the share of innovating enterprises. The public debate on innovation has

been activated together with the implementation of EU SF programmes, as well as with the changing competition landscape for Lithuanian enterprises.

2. Major innovation challenges and policy responses

Challenge 1: Improving skills for innovation and entrepreneurial attitudes

One of the major strengths of Lithuania is the relatively high share of science and engineering (S&E) graduates and a large share of the population with a tertiary education which are estimated respectively at 17.5 % and 25.2%. However, there remain concerns about skills shortages in certain fields. In this context, the challenge is actually two-fold. First, it is necessary to continue improving skill levels and qualifications of human resources. Second, the newly developed skills should be as relevant as possible to the industry needs. The Ministry of Education and Science in September 2004 launched a scheme "Improvement of the quality of human resources for R&D and innovation" within the framework of the Single Programming Document 2004 -2006. The main aim of this measure was to improve the quality of highly skilled human resources in the priority areas of science and technology (biotechnology, agriculture, forestry, mechatronics, laser and optical technologies, and in horizontal themes, such as innovation, entrepreneurship, languages). The measure focused on the master and PhD level qualification development in the selected fields. In addition, Ministry of Social Security and Labour, has launched the scheme for upgrading skills and competencies of occupied labour, in order to increase its adaptability to changes and requirements of modern economy (innovation, technology management, international communication, marketing, learning in knowledge economy, IT skills are among the core themes). Development of crosscutting competencies and especially the ability to apply knowledge for the creation of business and innovations are of crucial importance. In addition, NTB firm creation support infrastructure should be developed. The new SF implementation period will focus with the new magnitude on the improvement of innovation skills and the development of innovative firms with the new measures to be introduced in 2008 - 2013, where € 146.9 mio will be dedicated for the development of human resources in enterprises (life long learning systems and programmes), € 14.1 mio for the development of innovative and productive work models.

Challenge 2: Building R&D capabilities in firms and development of sound R&D base

Lithuanian business sector suffers from the extremely low R&D potential in business, first of all in terms of number of researchers in business sector, and in terms of R&D funding. Thus, the firms are not capable neither to perform internal R&D, neither integrate external R&D results into the business processes and innovation development. Although business R&D expenditures have been growing rapidly from close to zero in 1998, they were still only at the 14% of the EU average in 2005, and reached no more than 0.16% of GDP. In the few cases, when internal R&D is performed (large size enterprises in chemistry and pharmaceuticals, and SME's in lasers and biotechnologies), the companies find difficulties to establish productive co-operation with public R&D sector (except of the case of biotechnology and laser companies, which are spin-offs of state R&D institutes). Until recently, the policy measures were targeting R&D infrastructure development in both – public and business sector, namely establishing research excellence centres in priority areas – lasers, biotechnologies and mechatronics, and development of S&T parks for new technology based businesses. EU Structural funds in the period of 2004-2006 were used to support R&D projects in enterprises, which revealed the potential of businesses to absorb such funds being limited to the companies clustered in a few sectors – optical and medical devices, biotechnologies, electronics, chemistry and ICT. The new period of 2007-2013 of the EU Structural funds will focus extensively on this issue, supporting R&D activities within R&D centres (€ 74, 3 mio), development of R&D infrastructures, including enterprises and competence centres (€ 241.5 mio), support for R&D in enterprises (and SME's particularly, € 70.49 mio), investments in enterprises directly engaged in R&D and Innovations (new technologies, establishment of new technology based firms, university spin outs, R&D centres, etc., € 128.15 mio).

Challenge 3: Development of knowledge intensive clusters across public knowledge poles

While it is a prerequisite for Lithuania to invest more in R&D, both in financial terms and in terms of human capital, it is also very important to devote more reflection about how to generate greater impact in terms of outputs of investment in R&D and commercialisation. For the time being, Lithuania suffers

from the extremely low levels of knowledge application and patenting. According to the European Innovation Scoreboard (2007), the patenting level is close to zero, and Lithuania is doing not much better in community trademarks (19% of the EU level) and industrial design (4% of the EU level). Despite today's Lithuanian industrial structure reliance on the traditional R&D solutions, technology transfer and application, the improvement of current technologies and methods via new patentable solutions is needed in order to ensure industrial upgrade towards higher productivity and value added. However, industrialisation of R&D results on the larger scale is restricted by non existing competencies of IPR management (firs of all by most of inventors), limited efforts of companies to develop improved original solutions (resulting in patents and industrial design) via internal or joint R&D. In this way, the industry is running out of the future base for competition, and most of the firms, especially clustered in traditional sectors will face problem of survival in the nearest future (furniture, textile, wood and metal processing). Thus, building up relationships between business and R&D sector, development of knowledge intensive clusters is a key challenge for sustainable business innovation. The new measures to be implemented are aimed at the development of technology transfer and S&T partnership structures (science and technology parks, science, study and innovation valleys, etc) (€ 124.56 mio), development of innovation support services for enterprises and enterprise groups (€ 39.3 mio), and other investments in enterprises € 184.9 mio and measures to support R&D, innovation and entrepreneurship € 234.86 mio, which together should increase the number of innovating enterprises, and especially knowledge application in innovative activities.

The challenges identified are addressed by the set of measures, implemented under the EU SF implementation programmes for 2004-2006, and will be replaced by the new measures, related to the period of 2007-2013. It is important to note, that most of the measures were implemented in the last 24 months period, therefore the impact, based on indicators is far too early to apprise.

Summary table: innovation challenges, policy responses and impact

Challenge	Relevance of policy response	Evidence of impact
Improving skills for innovation and entrepreneurial attitudes	4	3
Building R&D capabilities in firms and development of sound R&D base	4	3
Development of knowledge intensive clusters across public knowledge poles	4	3

Policy response ranking scored from 1 to 5: (1) No specific measures addressing the challenge (possibly a debate but no evidence of any real policy development); (2) Policy development under way to respond to challenge (policy debate or design launched, e.g. announced in National Lisbon Reform Plan, etc.); (3) Specific measures existing for some time but insufficient to respond fully to challenge; (4) Existing measure plus one or more newly launched measures (during last 18 months); (5) A comprehensive set of measures which potentially responds fully to the challenge.

Evidence of impact scored from 1 to 5: (1) Trend for indicators has worsened since measure(s) introduced; (2) No observable change in trend since measure(s) introduced; (3) Too early to appraise (measures introduced in last 24 months); (4) Trend for indicators has improved since measure(s) introduced; (5) Evaluation or study indicates that the measure(s) has had clearly a positive effect on innovation performance in the country.

3. Innovation governance and policy trends

The developments in national innovation policy have demonstrated attempts to improve its co-ordination and implementation. Previously separated Science and Technology commission and Education and Science commission to the Government of Lithuania was integrated into the newly established Science, Technology and Innovation commission in spring 2005. Innovation policy making and implementation positions were strengthened with the establishment of Investments and Innovation department at the Ministry of Economy, thus transferring Innovation policy making to the upper ministerial level compared to previously being executed at the unit level only.

A bulk of innovation policy measures continued since 2004, following the tasks set for the SF programming period 2004-2006. The EU SF implementation Strategy for the period 2007-2013 will continue the measures from the first period, and also a set of new measures for business R&D and innovation will be launched. The Ministry of Economy has also continued the measures under the

Innovation and Competitiveness programme, targeted at the IPR protection in enterprises, business knowledge development, etc. Innovation financing remains an important issue, especially having in mind the absence of venture capital funds for innovation in Lithuania. New funding mechanisms and grant schemes for R&D and innovation were developed under the Single Programming Document 2004 – 2006 (as the main document for the allocation of EU Structural Funds), and new schemes will be introduced in the period of 2007-2013, such as guarantee funds for innovating enterprises, and the like. However, the implementation of the schemes until now was restricted by the complicated implementation procedures, which should be liberalised with the upcoming period of 2007-2013.

Lithuania continued development of the favourable business framework conditions, and since 2005, as a result of Lisbon process, particularly addressed innovation. New fiscal act was issued, reforming existing tax scheme on R&D investments by private undertakings, "For the purpose of calculating corporate income tax, research and development costs shall not be accrued and included in deductions of limited amounts; they shall be deducted from income as allowable deductions for the tax period in which they were actually incurred and they shall meet the criteria prescribed for allowable deductions in this Law". The same is valid for training and qualification improvement costs, if they result in formal higher education,. Together with other recent regulations in favour of business - reduction of profit and income tax, this should facilitate business R&D and innovation without direct policy intervention.

4. Conclusion: future actions and opportunities for innovation policy

In the current period Lithuania has made a tremendous progress in innovation policy making and implementation, to a major extent due the Lisbon process and implementation of NRP. Structural funds gave a real base to implement and sustain a wide range of innovation support measures, both in public and private business domain. Although the success of the implementation of measures is too early to appraise, and no new trends in EIS indicators appear, the current stage of play gives positive hope for the future.

The set of measures implemented has intensified orientation of enterprises towards innovation, especially those, having capabilities for R&D based innovations, modernisation of enterprises via innovative actions, and development of business and innovation support infrastructure. The new policy focus could be intensified on:

- creation and development new technology based firms, intellectual activity based entrepreneurship in all sectors of the economy. The provision of the tolls and sense of ownership in the creation of new business models in the economy needs to be given for the younger S&T professionals generation in order to ensure the intellectual resources are not wasted in the mid skill oriented careers.
- Development of innovation and creativity culture in all sectors of the economy, but also in the society, which is still very weakly addressed.
- Development of the creative spaces for the rise of new generation of high valued added ventures.

1. Main Trends and challenges in the National Innovation System

1.1 Recent Trends in Macroeconomic and Market Developments

At the end of 2007, the fast-growing Lithuanian economy started showing signs of deceleration. Although the GDP growth remained high at the 8.9 per cent rate in 2007, the forecasts for the 2008 and 2009 are related to the drop downs to approx. 6-6.5 percent yearly growth. Domestically-oriented sectors such as agriculture, construction, internal trade and transport, communications and storage were the most important drivers behind economic expansion. However, the internal market is already cooling due to the stagnating real estate and construction sectors what will have an adverse effect on production and sales of construction materials, furniture (which is an important Lithuanian specialization among EU) and domestic appliances. Export prospects are more uncertain than domestic factors. Shrinking growth in Latvia and Estonia, two key trade partners, will have a negative effect on the Lithuanian economy. On the other hand, hard times in Western and neighbouring economies will be offset by vigorous demand from CIS markets, especially Russia and Ukraine (SNG countries made ¼ of total Lithuanian export markets in 2007, while the EU – over 60 per cent).

The unemployment dropped to 4.3% in 2007, compared to 5.6% in 2006, and 11.4% in 2004 – the year of EU accession. It is expected to stabilise in 2008, which would be in favour of industry and business. The rapid drop in unemployment first of all is driven by the strong external factor - an open EU labour market, and not related to the changes in productivity or new job creation activities within the national economy. The recent changes in the world economy has also affected the Lithuanian economy, although indirectly. The economy slow down scenario changes from the soft to the hard lending with the estimated growth of unemployment because of the shrinking employment in the previously fastest growing sectors – construction and related industries, such as wood and furniture, metal, and lower consumption of dairy products, etc.

In the first months of 2008, year-on-year inflation shot up as high as 10 per cent. The main drivers were higher prices for imported natural gas and household gas, increases in excise duties for fuel and alcoholic beverages and a further climb in global oil prices. The closure of the second reactor at the Ignalina nuclear power plant will lead to the subsequent rise in electricity prices. In 2008, inflation was also supported by income policy: a cut in the personal income tax rate from 27 to 24 per cent and an increase in the minimum monthly wage from LTL 700 (€ 202.9) to LTL 800 (€ 231.9). Wages continue growing at a rapid rate. In the fourth quarter of 2007, gross remuneration was up by 18.5 per cent year-on-year, or more than twice as fast as the increase in labour productivity, which was still at the 45.8% of the EU 15 level 9 (61.4% of the EU 27) in 2007. In addition, according to the latest estimations, LTL 2.9million (nearly 3% of GDP) were sent back into Lithuanian economy by Lithuanian emigrants, which also kept the internal consumption high.

Innovation performance has not changed significantly during the same period, although Lithuania is already finalizing the first EU SF implementation period of 2004-2006. Compared to the other European Countries, Lithuania remains among the catching up countries with the SII 0.27, although improvement is approached. The general strengths of Lithuanian national innovation system lies in the well developed higher education sector with strong science and technology research tradition and engineering orientation. This result in relatively high share of population with tertiary education (26.8%), high numbers of S&T graduates among them (18.9%), and high enrolment of youth (88.2%). However, low participation in life long learning (4.9%) leads to the obsolete qualifications, actually not suitable for high skill work. The weak links between business and higher education and R&D communities result not only in obsolete qualifications of the highly educated labour force, but also in a low value added innovations, developed without an input from the R&D sector. Although the linking and technology transfer institutions are in place, due to the lack of endogenous R&D capacities, both, in public, and in business sector they are not able to bring significant changes. In terms of NIS development Lithuania is facing a major challenge in converting its innovation inputs into outputs

(knowledge applications and intellectual property). The number of innovative enterprises (CIS IV) remained low (18.4%). The turnover of them made up 52.3 % of total turnover of Lithuanian enterprises. As the companies face competition pressure caused by the increasing energy costs, labour shortages and growth of wages, we can expect the more active search for innovations, as a source of non cost based competitiveness, and consequently – increase of the share of innovating enterprises. The public debate on innovation has been activated together with the implementation of EU SF programmes, as well as with the changing competition landscape for Lithuanian enterprises.

Exhibit 1: Comparable indicators of economic performance

Indicator	National performance		EU 27 average	
	2002	2007	2002	2007
GDP per capita in PPS (EU27=100)	44,1	61	100*	100*
Real GDP growth rate (% change previous year)	6,9	8,9	1,2	2,9
Labour productivity per person employed (EU27=100)	48	61,4	100*	100*
Total employment growth (annual % change)	3,6	2,9	0,4	1,8
Inflation rate (average annual)	0,3	5,8	2,1	2,3
Unit labour costs (growth rate)	1,6	1,7	-0,4	-0,8
Public balance (net borrowing/lending) as a % of GDP	-1,9	-1,2	-2,5	-0,9
General government debt as a % of GDP	22,4	17,3	60,3	58,7
Unemployment rate (as % of active population)	13,5	4,3	8,9	7,1
Foreign direct investment intensity	1,8	3,5 [^]	:	1,8 [^]
Business investment as a percentage of GDP	17,4	22,8	17,3	18,7

Source: Eurostat - Structural Indicators and Long-term Indicators <http://epp.Eurostat.ec.eu.int>

Key: (*) EU25 average, (^) or latest available year (2006); (:) not available

1.2 Recent Trends in the National Innovation Performance

Lithuania has an overall innovation performance that places it among the group of “catching-up countries” with a performance that is well below EU average but increasing towards the EU average over time. Over the past 5 years Lithuania’s innovation performance has increased rapidly. If the trend continues, it should reach the EU average level of performance within ten years.

The analysis of Lithuanian innovation performance along the EIS categories shows relatively strong innovation drivers, but weak performance of Lithuanian Innovation system.

The Knowledge creation indicators demonstrate the asymmetry of Lithuanian NIS. With R&D expenditures Eur191 million (2006) Lithuania ranks relatively higher than other small EU new member states, contributing ca 0.08% of total EU27 R&D expenditures. At 0.8% R&D expenditure as a percentage of GDP (in 2006) Lithuanian R&D investment intensity is significantly lower than the EU 27 average of 1.84%. The share of GERD financed from abroad at 10.5% has been increasing rapidly since 2000 (reaching € 27.3 million in 2006 compared to € 4.9 million in 2000). Business R&D investments remained limited to 0.19% GDP in 2007, although it increased slightly compared to 2005 (0.16% GDP). The number of enterprises that received public funding remained as low as 3.6%, which makes 40% of EU average only. The indicators continue to prove the trend of R&D resource allocation and concentration exclusively within the public sector the R&D resources are concentrated within the public funds and public institutions.

The main business R&D investing sector remains industry (54.4 percent of total BERD in 2005), where manufacture of chemicals and chemical products is an absolute leader (19.8 percent of BERD in industry), manufacture of medical, precision and optical instruments (11.2 percent of BERD in industry), manufacture of fabricated metal products (10.7 percent of BERD in industry), manufacture of radio, television and communication equipment and apparatus (7.3 percent of BERD in industry), manufacture of electrical machinery and equipment (7.2 percent of BERD in industry). Services, comprising 42.4 percent of total BERD, are dominated by real estate (40.7 percent of total services R&D), financial intermediation (29 percent of total services R&D) and research and development (20 percent of total services R&D). The sectors aiming at the development of technological innovations are not dominating in the general economy specialisation structure, as the latter analysis will show.

The Entrepreneurship indicators demonstrate the weakness of Lithuanian enterprises in innovation activities. Well below the EU average are the indicators of innovation in house (14,6%, or 67% of EU average), innovation expenditures (73% of EU average), and organisational innovation (69% of EU average) but very strong orientation towards the innovation cooperation (163% of EU average). The entire composition of indicators suggests that Lithuanian enterprises are still weak innovation performers, and the type of innovation relationship they form is that of the “donor – recipient”, where Lithuanian enterprises are recipients of solutions developed elsewhere. The technology transfer activities remain the main type of innovative activities, which, in fact are not innovative, if not combined with innovation thinking. For example, Lithuanian printing industry showed tremendous growth rates in the last 5 years (up to 30%), while the EU average growth rate for the same industry was 1-2%.

Today however, the industry, affected by the growth of labour and energy costs and in the same time – increasing international competition, faces the problem of ineffective use of production capacities and productivity per hour worked (Jucevicius at all, 2008). I.e., the modern production capacities remain unexploited because of the lack of marketing and management capabilities, or lack of innovative thinking within the company.

According to Community Innovation Survey (2006) (Statistics Lithuania, 2008) in Lithuania, 43% of innovative enterprises collaborate in innovation activities. Suppliers were the dominating partner in innovations for all sectors. More than 25% of all innovations were generated in collaboration with clients or customers. Higher education institutions were important innovation partners in wholesale and retail (33.7 %), supply of electricity, gas and water (27.8 %), but also in construction (20.8 %) and industry (19.8 %). Public R&D institutes were important innovation partners in mining and quarrying, but no more important as suppliers and customers.

Despite relatively high cooperation rates in innovation activities with higher education and science institutions, it was not reported as being valuable or important type of innovation cooperation. The most striking fact is that only 1 % of manufacturing enterprises reported the cooperation with higher education institutions as a valuable one, although the intensity was rather high, as stated above. In other words, although enterprises are cooperating in the search of innovative opportunities, they do not result in a technological innovation.

As we know from the network and new technology based enterprise analysis (Laamanen and Autio, 1996; Karagozogu and Lindell, 1998; Coulson-Thomas, 2001), the size of the enterprise is important in its ability and willingness for networking. On the one hand, small enterprises, and especially new technology based firms are forced to network. However, they often lack capacities and competencies for such activities. On the other hand, large size enterprises have more resources for networking, but less external triggers. In the Lithuanian case, the most active in collaboration were large size enterprises (73.72 %). Small and medium size enterprises were equally active in networking: 53.42% and 56.31 % respectively. Still, suppliers remained the dominating innovation partners in all size categories. However, the abilities for partnership were reduced together with the size of enterprise. Customers were the partners of second importance. Consultants, private research labs and R&D institutes were third important innovation partners in case of large and medium size enterprises (respectively 40.15 % and 27.61 % of all innovations were generated jointly). The least important partner for innovation in all size categories were public R&D establishments. The differences between LSEs and SMEs were important – 19.71 % of LSEs generated innovation in partnership with public R&D establishments, whereas only around 8.7% of SMEs were engaged in this type of cooperation. Universities were more active innovation partners in the case of LSEs: 29.2 % developed innovation in cooperation with universities; in the case of SMEs, there were around 10.5 % of partnerships with universities.

Despite the intensity of collaboration, its value was rather limited, especially in the case of cooperation with science and higher education sector. In fact, we can consider it as a total failure in the case of large size enterprises, and only some success in the case of small enterprises. About 2.5 % of small enterprises quoted cooperation with public R&D and higher education arrangement as successful, but it is relatively good evaluation in this size group, as it is close to the cooperation success with other enterprises or consultants. Private R&D establishment were more successful in innovation

partnerships (around 10 percent of LSEs and 5 percent of SMEs mentioned it as a valuable type of cooperation), which shows the importance of private R&D establishments within NIS, as they perform the role of public knowledge transfer for the private sector via application of problem solving approach (Uus and Kriaucioniene, 2006).

In concluding the analysis of networking and partnerships for innovation, we can state that despite of intensive application of networking tools in innovation activities, the productivity of interaction within network is rather limited. We must admit that there is a lack of effective networking mechanisms, as well as the abilities to exchange knowledge, and especially generate technological innovations based on it.

Kriacioniene, Janiunaite, Jucevicius (2008) point to the problems related to the quality of collaboration in Lithuanian business sector:

- The Lithuanian enterprises can only make use of the standard, explicit technological solutions (or standardised, encoded knowledge) in their innovative activities, while other types of knowledge that call for more sophisticated mechanisms of knowledge transfer and greater learning needs are not fully functioning (despite numerous efforts)
- Besides, the Lithuanian enterprises are more inclined to use the informal channels of knowledge transfer, i.e. to absorb the knowledge from their „social environment“ – partners and suppliers with whom they have co competitive relations.
- The similarity of knowledge provider and recipient plays an important role in the knowledge transfer – the industrial information received during the fairs, exhibitions and conferences is valued over other sources of information, such as research organizations. The main sources of information are the business partners.
- The more sophisticated mechanisms of knowledge transfer that call for a more active participation of the company, such as absorption of customer knowledge (or market knowledge) and consultant knowledge are not functioning effectively (true for companies of all sizes)
- Although the innovation theory claims that large enterprises are more successful in cooperating with the science sector due to their better absorptive capacities, it is not the case in Lithuania. Despite the fact that large enterprises had more cooperative links, they were not deemed of importance to their innovative activities. On the contrary, small enterprises achieved better results as far as cooperation with research institutions is concerned.
- The mechanisms of knowledge transfer do not depend on the sector. Suppliers, business partners and clients are regarded as the most useful partners in innovative activities across all the analyzed sectors.

Such findings could be partially explained by the labour composition in the business sector that determines the low absorptive capacity of business sector and the historical divisions of science and industry. However, it is clear that more sophisticated knowledge interactions, such as learning from the market and other system actors, are not being developed. *The basic forms of innovative activities prevail where the main power belongs to the suppliers of technologies.*

The “Application” indicators support the previous statements on the weakness of Lithuanian enterprises in generating innovations. Employment share in high tech services reaches 2.2 % (66 % of EU average), and in high tech industries – 4.7 % (28% of EU average), and in mid high tech manufacturing – 2.4 % (37 % of EU average). The sales of new to firm products (5.3 %) dominate over the sales of new to market products (4.4 %). The data prove that Lithuanian economy is dominated by traditional industries, competitiveness of which is still based on the productivity and costs management but not innovative activities.

The investments in knowledge (education, R&D, innovation, training, etc.) and innovation infrastructure (innovation support infrastructure and broadband penetration) are the only relative strengths of Lithuanian innovation system. Although the broadband penetration rate is still at the 51 % of EU average or 8.4 %, the ICT expenditures grow rapidly and are at the 122 % of EU average. The recent data from the Internet world statistic show, that internet population penetration rate is at the 37.4 %, while the EU average is at the 48.1 % (source:

<http://www.internetworldstats.com/stats4.htm#europe>).

The higher education related indicators show the long term tradition of the youth involvement in higher education, and also high shares of S&T graduates. 26.8 % of population are holders of higher education degree, youth involvement in tertiary education reaches 88.2 %, and 18.9 % of university graduates are in the field of engineering and science (EIS, 2007). Still, the engineer occupation is not taken by all the graduates consequently. The human resources for R&D in business were limited to 5.4 % of total human resources for R&D in Lithuania. 1.7 % of all doctorate holders were employed in business sector. The extremely low share of R&D personnel in business sector hinders its absorptive capacity. It may explain the above presented analysis of the failure of R&D and business cooperation in Innovation activities. Only few sectors of the economy distinguish with the higher employment of R&D personnel, namely machinery and equipment, optical and medical devices, chemicals (including pharmaceuticals) and R&D intensive services and ICT.

The participation in lifelong learning has tripled since 2004. In 2006, 8.4 % of working population was involved in life long learning activities (which is still at the 51% of EU average). The measures, implemented in the Life long learning area under the EU SF 2004-2006 period has show a significant impact. The activities will be continued with the new measures planned for the period 2007-2013.

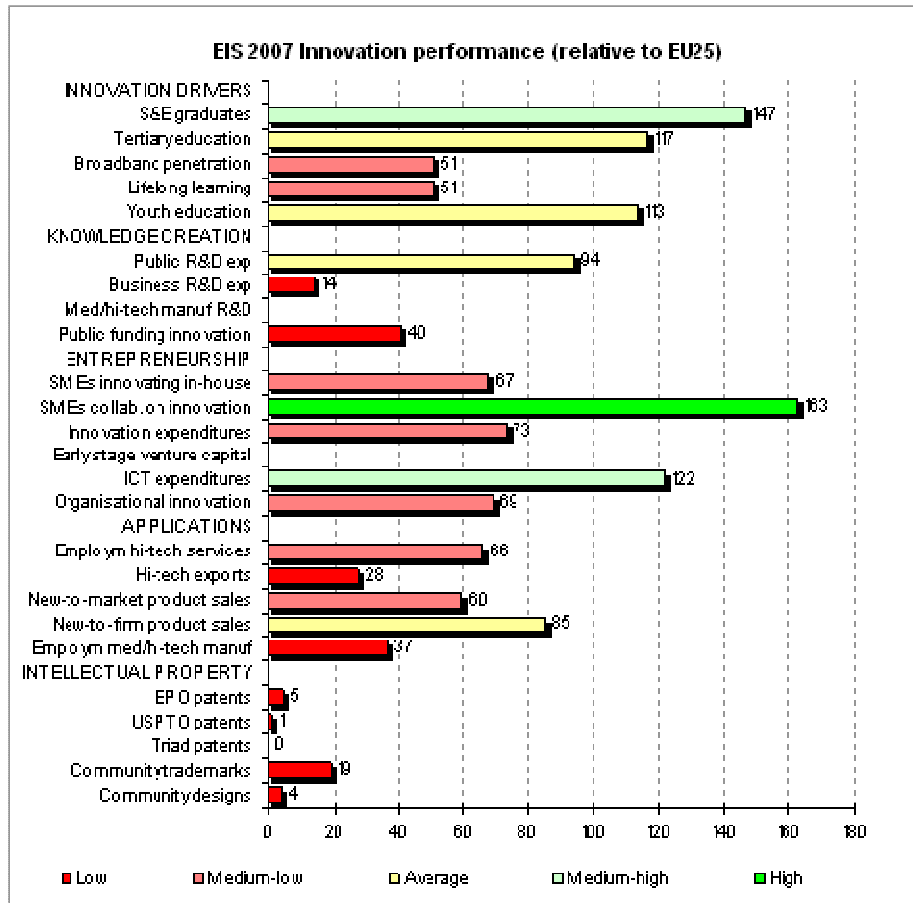
The intellectual property development activities are close to zero in Lithuanian economy, and the trend is not changing for years. Lithuanian patenting rates were as low as 9.62 EPO patents in absolute numbers or 2.7 EPO patent per million inhabitants in 2004, 0.67 in absolute numbers were high tech patents. The gap between EU 15 (old member states), with over 300 patents per million of labour force, and the New Member States (NMS), with over 17 patents per million of labour force remains tremendous. Lithuania is still significantly lagging behind the NMS average, with only 5.95 patents per million of labour force. The triad patents and community design indicators are at the same zero level. The only community trademarks are at the 19 % of EU average, and reach 20.9 %. The low levels of patenting are related to the sectorial structure of Lithuanian economy, and also the prevailing supplier driven innovation type in the innovation activities. The alignment of the country's scientific and industrial specialization (Erawatch, 2007) is also an unaddressed policy question. As Lithuanian Country R&D Specialisation Report (Erawatch, 2007) shows, the highest numbers of publications (or scientific specialisation) was achieved in the fields of materials, engineering, computer science, chemistry, physics and mathematics. With regard to the scientific specialisation, Lithuania exhibits strengths in all fields of natural sciences, such as physics, mathematics, materials, engineering, computer sciences and chemistry. During the period 2001-2003, Lithuania's technological specialisation was limited in only two sectors of electronic equipment and of office machinery. I.e. only those two sectors were demonstrating the original technological knowledge based growth and development. The fact partially correlates with the scientific specialisation in natural sciences (physics, mathematics, materials) and engineering and computer sciences. However, as we see from the analysis above, the scientific knowledge leads to the development of technological knowledge in very limited terms. Therefore, we come across a case of non innovative (i.e., not related to the entrepreneurship) scientific activity, when public R&D expenditures (dominating in Lithuanian R&D funding) are not leading to the development of technological knowledge.

From the regional perspective, Lithuanian development remains uneven, with the highest concentration of innovative activities within the three major cities – Vilnius, Kaunas and Klaipeda. These are the cities with high concentration of public knowledge, population density, and developed industries. Permanent winning and losing counties are emerging in the country in competing for the businesses, skilled labour, FDI, and EU structural support. The first SF programming period 2004 – 2006 has divided regions into winners and losers, especially in competing for R&D and innovation in business funds, as well as for highly skilled human resources for R&D and innovation development funds. Most of them were absorbed by the business enterprises and R&D establishments, higher education institutions in Vilnius and Kaunas. The fact is not surprising, since these are the cities having concentrated potential for such activities.

The description provided above suggests that innovation policy implementation in Lithuania historically was and remains targeted mainly at the three largest cities, defined by the capability to absorb the policy funds and implement measures. The other regions are not capable to catch up with the innovation policy development unless special measures, designed for local needs, will be implemented. Last but not least, the lack of competence of local authorities in innovation policy

management and the possible roles of local governments in innovation support and development also play a significant role. Pro active approach in innovation development is highly lacking.

Exhibit 2: European Innovation Scoreboard: country pages



INNO-Policy TrendChart

Lithuania		1999	2000	2001	2002	2003	2004	2005	2006	Rel. to EU	Ref. year
Summary Innovation Index					0.23	0.24	0.24	0.26	0.27		
<i>rank</i>					30	30	29	27	27		
IINPUT - Innovation drivers					0.47	0.47	0.48	0.52	0.52		
1.1	S&E graduates	11.7	13.5	14.8	14.6	16.3	17.5	18.9	--	147	2005
	<i>relative to EU</i>	126	132	137	129	134	141	147	--		
1.2	Population with tertiary education	42.6	41.8	22.4	21.9	23.2	24.2	26.3	26.8	117	2006
	<i>relative to EU</i>	--	215	114	110	112	112	118	117		
1.3	Broadband penetration rate	--	--	--	--	--	2.5	5.0	8.4	51	2006
	<i>relative to EU</i>	--	--	--	--	--	33	42	51		
1.4	Participation in life-long learning	--	--	--	--	--	5.9	6.0	4.9	51	2006
	<i>relative to EU</i>	--	--	--	--	--	63	62	51		
1.5	Youth education attainment level	--	--	--	81.3	84.2	85.0	87.8	88.2	113	2006
	<i>relative to EU</i>	--	--	--	106	109	110	113	113		
IINPUT - Knowledge creation					0.16	0.17	0.16	0.19	0.19		
2.1	Public R&D expenditures	0.48	0.47	0.48	0.55	0.53	0.60	0.61	--	94	2005
	<i>relative to EU</i>	75	72	74	83	80	94	94	--		
2.2	Business R&D expenditures	0.02	0.13	0.20	0.11	0.14	0.16	0.16	--	14	2005
	<i>relative to EU</i>	2	11	17	9	12	14	14	--		
2.3	Share of med-high/high-tech R&D	--	--	--	--	--	--	--	--		
	<i>relative to EU</i>	--	--	--	--	--	--	--	--		
2.4	Enterprises receiving public funding						3.6			40	2004
	<i>relative to EU</i>						40				
IINPUT - Innovation & entrepreneurship					0.33	0.33	0.33	0.37	0.40		
3.1	SMEs innovating in-house						14.6			67	2004
	<i>relative to EU</i>						67				
3.2	Innovative SMEs co-operating with others						14.8			163	2004
	<i>relative to EU</i>						163				
3.3	Innovation expenditures						1.57			73	2004
	<i>relative to EU</i>						73				
3.4	Early-stage venture capital	--	--	--	--	--	--	--	--		
	<i>relative to EU</i>	--	--	--	--	--	--	--	--		
3.5	ICT expenditures	--	--	--	--	5.9	7.0	7.8	--	122	2005
	<i>relative to EU</i>	--	--	--	--	92	109	122	--		
3.6	Organisational innovation						23.6			69	2004
	<i>relative to EU</i>						69				
OUTPUT - Applications					0.17	0.18	0.20	0.20	0.21		
4.1	Employment in high-tech services	--	--	--	1.7	1.7	1.9	2.1	2.2	66	2006
	<i>relative to EU</i>	--	--	--	50	50	60	65	66		
4.2	Exports of high technology products	2.1	2.6	2.9	2.4	3.0	2.7	3.2	4.7	28	2006
	<i>relative to EU</i>	10	12	14	13	16	15	17	28		
4.3	Sales new-to-market products						4.4			60	2004
	<i>relative to EU</i>						60				
4.4	Sales new-to-firm products						5.3			85	2004
	<i>relative to EU</i>						85				
4.5	Med-hi/high-tech manufacturing employment	3.9	3.2	3.1	2.6	3.0	2.8	2.6	2.4	37	2006
	<i>relative to EU</i>	--	43	42	37	44	41	39	37		
OUTPUT - Intellectual property					0.00	0.00	0.01	0.01	0.02		
5.1	EPO patent	1.0	2.5	2.2	2.8	5.8	--	--	--	5	2003
	<i>relative to EU</i>	1	2	2	2	5	--	--	--		
5.2	USPTO patents	0.8	1.8	1.8	0.4	0.5	--	--	--	1	2003
	<i>relative to EU</i>	1	3	3	1	1	--	--	--		
5.3	Triad patents	0.2	0.3	0.2	0.2	1.5	0.4	0.1	--	0	2005
	<i>relative to EU</i>	1	1	1	1	7	2	0	--		
5.4	Community trademarks	--	0.3	0.3	0.0	2.3	4.9	8.5	20.9	19	2006
	<i>relative to EU</i>	--	0	0	0	3	6	10	19		
5.5	Community designs	--	--	--	--	0.0	6.7	6.7	4.4	4	2006
	<i>relative to EU</i>	--	--	--	--	0	8	7	4		

Identified Challenges

Challenge 1: Improving skills for innovation and entrepreneurial attitudes

One of the major strengths of Lithuania is the relatively high share of science and engineering (S&E) graduates and a large share of the population with a tertiary education which are estimated respectively at 18.9 % and 26.8%. However, there remain concerns about skills' shortages in certain fields. In this context, the challenge is actually twofold. First, it is necessary to continue improving skill levels and qualifications of human resources. Second, the newly developed skills should be as relevant as possible to the industry needs. The Ministry of Education and Science in September 2004 launched a scheme "Improvement of the quality of human resources for R&D and innovation" within the framework of the Single Programming Document 2004 -2006. The main aim of this measure was to improve the quality of highly skilled human resources in the priority areas of science and technology (biotechnology, agriculture, forestry, mechatronics, laser and optical technologies, and in horizontal themes, such as innovation, entrepreneurship, languages). The measure focused on the master and PhD level qualification development in the selected fields. In addition, Ministry of Social Security and Labour, has launched the scheme for upgrading skills and competencies of occupied labour, in order to increase its adaptability to changes and requirements of modern economy (innovation, technology management, international communication, marketing, learning in knowledge economy, IT skills are among the core themes). Development of cross-cutting competencies and especially the ability to apply knowledge for the creation of business and innovations are of crucial importance, because as the EIS indicator analysis shows, the ability of Lithuanian enterprises to design innovations is rather low.

The entrepreneurial thinking, as a substantial part of the innovation process, is weakly developed in all the sectors of economy – business, public sector, and government. In business, it manifests as the lack of new ideas, creativity, and ability to see new opportunities and enter new markets. The EIS indicators of "new to market products" (4.4 %), supports the statement. In addition, the development of new technology based firms and their impact for the economy remains very limited – employment in high tech services is limited to 2.2 %, in high tech industries – 4.7 %, and in mid high tech industries – 2.4 %. It is obvious, that today not the knowledge intensive sectors drive the economy, although Lithuania has set the aim to proceed towards knowledge economy and high value added economic activities, as stated in the NRP programme. In this light, the development of new technology based firms, and also – knowledge intensive firms in all sectors of economy becomes of crucial importance in order to achieve national development goals.

Challenge 2: Building R&D capabilities in firms and development of sound R&D base

Lithuanian business sector suffers from the extremely low R&D potential in business, first of all in terms of number of researchers in business sector, and in terms of R&D funding. Thus, the firms are not capable neither to perform internal R&D, neither integrate external R&D results into the business processes and innovation development. Although business R&D expenditures have been growing rapidly from close to zero in 1998, they were still only at the 14 % of the EU average in 2005, and reached no more than 0.16 % of GDP. In the few cases, when internal R&D is performed (large size enterprises in chemistry and pharmaceuticals, and SME's in lasers and biotechnologies), the companies find difficulties to establish productive co-operation with public R&D sector (except of the case of biotechnology and laser companies, which are spin-offs of state R&D institutes). Until recently, the policy measures were targeting R&D infrastructure development in both – public and business sector, namely establishing research excellence centres in priority areas – lasers, biotechnologies and mechatronics, and development of S&T parks for new technology based businesses. EU Structural funds in the period of 2004-2006 were used to support R&D projects in enterprises, which revealed the potential of businesses to absorb such funds being limited to the companies clustered in a few sectors – optical and medical devices, biotechnologies, electronics, chemistry and ICT.

Challenge 3: Development of knowledge intensive clusters across public knowledge poles

While it is a prerequisite for Lithuania to invest more in R&D, both in financial terms and in terms of human capital, it is also very important to devote more reflection about how to generate greater impact in terms of outputs of investment in R&D and commercialisation. For the time being, Lithuania suffers from the extremely low levels of knowledge application and patenting. According to the European

Innovation Scoreboard (2007), the patenting level is close to 0, and Lithuania is doing not much better in community trademarks (19 % of the EU level) and industrial design (4 % of the EU level). Despite today's Lithuanian industrial structure reliance on the traditional R&D solutions, technology transfer and application, the improvement of current technologies and methods via new patentable solutions is needed in order to ensure industrial upgrade towards higher productivity and value added. However, industrialisation of R&D results on the larger scale is restricted by non existing competencies of IPR management (firs of all by most of inventors), limited efforts of companies to develop improved original solutions (resulting in patents and industrial design) via internal or joint R&D. In this way, the industry is running out of the future base for competition, and most of the firms, especially clustered in traditional sectors will face problem of survival in the nearest future (furniture, textile, wood and metal processing).

According to the analysis of the industrial specialisation, we can classify Lithuania as a country dominated by the 'specialised suppliers' sectors (in the typology by Pavitt, 1984) or the 'complex systems' and 'product engineering' regimes (in the typology by Marsili, 2001), where innovation is mainly the result of development (as opposed to research) or engineering activities. Therefore, for a small country with this innovation profile, networks, partnerships and collaborations become of crucial importance, as 'innovation capacities of firms are based mainly on specific, and to a large extent, tacit collective capabilities, formed by internal collective learning process. This does not imply that relations with academic research are unimportant, but they concern mainly engineering disciplines (mechanical and electrical engineering, computer science) or general scientific knowledge (mathematics), which is in fact the actual scientific specialisation of Lithuania. One of the key problems within this regime for firms is the capacity to have access and to combine various technical knowledge and capabilities. Although the insufficiencies in market formations are partially replaced by the development of institutional opportunities and the firms are executing innovation search activities within networks, it does not lead to successful results manifested in the development of technological innovations. The reasons must be objective – a lack of direction and original scientific knowledge to be transferred into technologies, but also subjective – such as a lack of absorptive capacities of firms, missing learning mechanisms. As entrepreneurship is considered the linking function between technological, market and institutional opportunities, entrepreneurial and intrapreneurial skills obtained in a system play an important role. In the case of Lithuania, we find that the entrepreneurial behaviour is weakly expressed in values, attitudes and behaviours of the population.

Thus, building up relationships between business and R&D sector, development of knowledge-intensive clusters is a key challenge for sustainable business innovation. The new measures to be implemented are aimed at the development of technology transfer and S&T partnership structures (science and technology parks, science, study and innovation valleys, etc) (€ 124.56 mio), development of innovation support services for enterprises and enterprise groups (€ 39.3 mio), and other investments in enterprises € 184.9 mio and measures to support R&D, innovation and entrepreneurship € 234.86 mio, which together should increase the number of innovating enterprises, and especially knowledge application in innovative activities.

The challenges identified are addressed by the set of measures, implemented under the EU SF implementation programmes for 2004-2006, and will be replaced by the new measures, related to the period of 2007-2013. It is important to note, that most of the measures were implemented in the last 24 months period, therefore the impact, based on indicators is far too early to apprise.

Exhibit 3: Main innovation policy challenges

Description of challenge	Relevant indicators and trends
1.Improving skills for innovation and entrepreneurial attitudes	The challenge is based on a combination of high level of population with tertiary education and S&E graduates on one hand, and low application of the skills in the economy, first of all resulting in a low level of new to market innovations, absence of organisational innovations absence of new technology based firms, low level of employment in high tech services and industries,

2. Building R&D capabilities in firms and development of sound R&D base	Business R&D remains among the lowest in the EU - 0.17 GDP, number of researchers in business sector per employee is close to 0, weak position in development of any other type than supplier oriented innovations
Development of knowledge intensive clusters across public knowledge poles	Cooperation in business innovation is one of the few positive EIS indicators, which offers opportunity to reinforce networking for innovation and clusterisation of knowledge intensive activities.

The composition of challenges identified shows that Lithuanian innovation system suffers from the lack of internal capabilities to transfer innovation inputs into the outputs. The strongest part of the system – the composition of skills present in the economy, actual ICT investment and internet penetration rates - should be actually “driving” the system towards innovation and knowledge intensive businesses,. However, the long term positive trend in these indicators does not impact the actual innovation performance and employment structure, which is much more typical for less educated and ICT integrated countries. The lack of institutional support, formal R&D knowledge to be used as an input for innovation processes are important restrictions for innovation processes, however, the need for value innovation, new ways to market given the Lithuanian innovation structure are of the primary importance.

The first challenge of improving skills for innovation and entrepreneurial attitudes also relates to the second challenge identified “building R&D capabilities in firms and development of sound R&D base”. In order to develop other than supplier driven innovations within firms (basically, in the form of acquisition of new technologies), the R&D capabilities of firms has to be strengthened. At the current business R&D investment level and the composition of the labour force in industry, it is obvious, that Lithuanian business sector is not ready to initiate and drive innovative processes, and imitates innovations developed elsewhere (with the few exceptions). As a consequence, formally acquired high skills of population are wasted and diminishing in the course of low level careers and non creative business operations. The partnership practices between business and R&D sectors are weak, and restricted by mutual mistrust. As the Knowledge economy Forum (2008) survey on business and R&D sector partnership opportunities show, businesses evaluate the existing supply of R&D knowledge at the below of average level, criticise the public sector for the “lack of reality” in the cooperation processes, while Science sector criticise the business sector for the inability to absorb original scientific solutions, lack of absorptive capacity and understanding on how to turn the scientific results into innovations. The survey not only proves the need to strengthen the knowledge supply and absorption side in the economy, but also to develop the links between the two main innovation-related sectors – R&D and business. This need points to the third challenge “development of knowledge intensive clusters across public knowledge poles”.

With the Lithuanian case, the R&D capabilities and resources (financial and human) exceptionally are concentrated in the public sector. The cooperation between the sectors does actually happen, but is not quoted as an effective one by the business sector (see CIS IV result analysis in the section 1.2) because of the reasons identified in the description of the 2nd challenge, and also because of the limited circulation of knowledge between the sectors. The reasons lie also in the Lithuanian industrial structure, which, as noted above, is classified as an engineering knowledge based, or development rather research oriented and works in the ‘complex systems’ and ‘product engineering’ regimes (in the typology by Marsili, 2001), where innovation is mainly the result of development (as opposed to research) or engineering activities. Therefore, for the a small country with this innovation profile, networks, partnerships and collaborations becomes of crucial importance, as ‘innovation capacities of firms are based mainly on specific, and to a large extent tacit collective capabilities, formed by internal collective learning process. This does not imply that relations with academic research are unimportant, but it concerns mainly engineering disciplines or general scientific knowledge. One of the key problems within this regime for firms is the capacity to have access and to combine various technical knowledge and capabilities. Therefore, the access to public knowledge in the Lithuanian case is of crucial importance for high value added innovation development. However, it does not happen without specific policy impact, as the weak results of intensive cooperation for innovation results show.

2. Innovation governance and policies: key trends in structures and performance

2.1 The national innovation governance system: an appraisal

The Lithuanian Innovation policy framework has undergone significant changes since 2001. In order to achieve higher co-ordination of innovation policy between core stakeholders, and especially the Ministry of Economy and Ministry of Science and Education, a Science and Technology Commission to the Government of Lithuania was established in 2002, which was responsible for integrated innovation policy development. However, since its establishment the institution has been critiqued as having not enough institutional power to have tangible impact on the synchronisation of policy actions due to its consultative nature. In spring 2005 the Commission was reorganised into the Science, Technology and Innovation Commission, which joins the efforts of scientific and business community, government bodies and serve the national aim of faster economy upgrade towards a knowledge intensive economy.

Lithuanian science community, represented by Lithuanian Science council, in the initial stages played crucial role in shaping R&D and Technology policy. The institution has influenced the development of several important policy documents, including the Lithuanian White Paper on Science and Technology (2002). Today, the Lithuanian Science community, and the Council remain highly important in the development of the NIS and the technological orientation of the country as it is responsible for R&D policy setting and prioritisation of Science. Since December 2007 it acts as a permanently functioning agency, responsible for the competitive funding of research programmes. Still, the main responsibility for corporate R&D lies with the Lithuanian Ministry of Economy, as a part of Innovation and Competitiveness programme.

Lithuanian Ministry of Economy, being directly responsible for innovation policy implementation, since 2001 has build up innovation policy making and support capacities. The establishment of an Innovation and Technology division in the Ministry of Economy in 2004 was the first step to improve coordination of innovation policy making and delivery within the Ministry. The main tasks of the department are to participate in the development and implementation of national innovation and technology development policies, to contribute to the development of the national innovation system by maintaining an innovation support network, to develop state aid schemes for innovation and technology in enterprises and to strengthen the links between the different NIS agents. It also develops proposals for the improvement of the conditions for innovation in businesses and related measures. In 2006, the Ministry structure was adjusted in order to meet the increasing importance of innovation policy for the national economy. An Investments and Innovation department was established, which integrated the division of Innovation and technology, and the Division of Investments.

The Business Project Selection Committee of the Ministry is responsible for the final decision of state aid provision for the business enterprise and competitive public projects. The Committee comprises of representatives from various ministries and other institutions. The business projects are evaluated and state aid is administrated by Lithuanian business support agency (established in 2003) to the Ministry of Economy. The agency is responsible for the allocation of EU pre-accession funds (such as Phare 2002, 2003), National funds for innovation and competitiveness, and EU Structural funds aimed at the competitiveness of the economy.

The Support Foundation European Social Fund Agency (former Lithuanian Fund for Human Resources Development Programmes) supports, coordinates, and administers EU SF aid and implements measures assigned to the Ministry of Education and Science of development of highly skilled human resources for science, technology and industry. It also implements measures of the life-long learning and improvement of the quality of human resources in the business sector, which are under the responsibility of the Ministry of Social Security and Labour.

In addition, since 2003, after approval of Science and Technology parks development concept, the whole infrastructure of Science and technology parks was established.

2.1.1 Main changes in the national governance system

The main changes in the national innovation governance system are related to the Science and Higher education reform. The design of R&D public funding mechanisms, the reorganisation of the Lithuanian R&D system will be highly influenced and shaped by the new model for Competitive R&D funding in Lithuania, approved in December 2007 by the Government. It is increasingly and widely understood that strategic technological innovation will not occur without strong Science and Technology policy setting and reorganisation of R&D funding mechanisms, in order to reinforce R&D competition and reorientation from fundamental research towards economy needs oriented applied research. Innovation in industry will be highly influenced by the knowledge inputs, strategically defined by the Lithuanian Science Council. Changes of the legal base in 2007-2008 provided the Lithuanian Science Council (to the Ministry of Education and Science) with the status of a permanently functioning agency, responsible for the competitive funding of research programmes. Still, the main responsibility for corporate R&D lies with the Lithuanian Ministry of Economy, as a part of Innovation and Competitiveness programme.

The new changes in the governance structure will be related to the change of Government in November 2008 after the Parliament Elections. If the conservative and liberal right parties form the majority in the government, the governance structure and style will undergo significant changes, which will be related to the cuts in public spending and bureaucracy as a response to the increasing budget deficit and a tool of economic crises management.

As 2008 was the election year, there were no significant changes in the governance structure; neither the evaluation was carried on. In fact, the evaluation of governance and policy making effectiveness is performed only if forced by the third parties (EU, for example).

2.1.2 Main changes in the regional governance system

Regional policy is implemented by various bodies: the National regional development agency, the Administrations of Counties and Municipalities and Regional development agencies; innovation policy in particular today is implemented by national level institutions only, such as Technology parks, Business incubators, Business information centres and the Lithuanian innovation centre.

Lithuania, being a small country with 3,2 mio of population undoubtedly is a “mono region” country in EU terms. Still, there are lower administration units than the national government - counties (10 in Lithuania) and Municipalities (the lower level), which are over 60 today. Counties are large geographical entities, governed by the governor’s administration; the governor is responsible for implementing the regional policy set by the central government at local level. The governor is directly responsible to the central government of Lithuania and is appointed to its duties due the decision of government. Municipalities are the primary level local governments, which are responsible for the local development of infrastructure, healthcare, social care, education (except of higher) and other public services. Although it has a responsibility for the economic development, it is mainly limited to the development of basic infrastructure (such as roads, industrial zones, etc.), but not business and innovation infrastructure, which is directly assigned to the Lithuanian Ministry of Economy. It manifests itself in establishment of Business incubators in collaboration with local governments or higher education institutions), Science and Technology parks (in collaboration with local higher education establishments and in some cases – municipalities) and Business information centres (in collaboration with municipalities) in regions. But in all cases the established structures report directly to the Ministry of Economy but not to the local governments. Today there are 10 technology parks operating in major cities of Lithuania, 7 business incubators in different regions of the country, and 42 business information centres, covering the whole country. All of these structures are founded by the Ministry of Economy and local authorities. The Lithuanian innovation centre (LIC) has expanded its activities to the main Lithuanian cities in 2003, in this way delivering innovation services to the regions and aiming to facilitate innovations at the regional level.

The influence of municipalities to the innovation policy development is highly restricted with the centralised resource allocation system and limited funds, available for business development. Each larger municipality tends to have business development fund, but its financial power in fact is close to zero (10 000 EUR per year in average).

Innovation components (weakly expressed) could be found in regional development strategies, as well in the strategies of some municipalities, as measures aimed at the regional competitiveness. Regional development strategies and specific measures are designed with regard to the general economic indicators (such as unemployment rates, GDP growth, level of industrialisation), but not specific innovation performance indicators, because there are not appropriate innovation indicators at regional level.

Regional innovation policy development in Lithuania still remains at initial stages today. Regional development is foreseen by policy papers, such as the National Regional development strategy, Regional development strategies of Counties, and Strategies of development of Municipalities (development of entire strategies is still an ongoing process). The important steps towards development of regional innovation systems are made with the ongoing implementation of 2 Regional Innovation Strategy development projects (supported by FP6 programme) in Lithuania. The project leaders are the Lithuanian Innovation Centre (www.lic.lt) and the Kaunas Regional technology business incubator (www.ktc.lt). The projects are aimed at the development of regional innovation strategies, regional innovation indicators, and project pipelines for the implementation of designed strategies.

Innovation components (weakly expressed) could be found in regional development strategies, as well as in strategies of some municipalities, as measures aimed at regional competitiveness. Regional development strategies and specific measures are designed with regard to general economic indicators (such as unemployment rates, GDP growth, level of industrialisation), but not specific innovation performance indicators, because there are not appropriate innovation indicators at the regional level.

The regions will be given the larger power to influence development strategies via the allocation of the part of the EU SF for the 2007-2013, but not for innovation. It must be noted, the implementation of the structural funds are significantly delayed in Lithuania, which is also inducing delays in the implementation of measures foreseen for regions.

2.2 Focus and trends of national and regional innovation policies

2.2.1 The innovation policy mix

By innovation policy mix we mean the combination of direct (grants) and indirect (for example tax incentives) innovation policy measures from one or more national organisations and agencies in order to stimulate enterprise innovation activities.

The distinguished feature of Lithuanian innovation policy mix is direct policy interventions in business sector with R&D and technology upgrade grants. Development of innovation support infrastructure remains in the domain of public resources. Business sector remains in most of the cases only the recipient of those initiatives, without participation in funding and management of the innovation support organisations. Regulatory measures, first of all taxes, are targeting general business conditions, with low corporate tax and tax reductions on R&D and technology investment.

Innovation policy is achieving specific targets via implementation of various measures, especially since 2004 combining State and EU SF funds. The currently applied set of measures indicates the progress of NIS development in the narrow sense – development of competitive R&D base, improving linkages and knowledge transfer between R&D and business sectors, development of highly skilled resources for innovation, etc. Moreover, major R&D development targets, following the Lisbon Strategy, are set in a quantitative statement – to increase R&D funding by 0.1% of GDP annually, and achieve 1% of GDP by 2012. The other 2 % of GDP, following the Lisbon agenda, should come from the business sector. This is supported today by tax incentives, allowing enterprises to report R&D and

patenting expenditures like any other business expenditures, differently from previous regulation that forced these types of expenditures to be covered by profit. Having in mind very low business investments in R&D, and weak linkages between R&D and business communities, the tax incentive might be insufficient to achieve these ambitious goals. The Lithuanian government in its programme for 2004 - 2008 has set the target to develop special schemes, that would promote business investments in R&D, and until now these are the schemes operated under Phare 2002 and Structural Funds programmes, with very limited impact (for example, slightly more than 50 enterprise R&D projects granted in the programming period 2004- 2006).

The development of NIS in a broad sense is much less addressed by the clearly identified targets and following a complex set of measures. The development of an entrepreneurial and innovative culture in the society, venture capital funds remain more declarative statements.

The most successful long term government actions related to innovation could be defined as continuing improvement of business and investment conditions. One of the major goals of Lithuania, since it regained its independency, was to create a functioning market economy and favourable business conditions. Simplification of business establishment and bankruptcy procedures, favourable tax system, promotion of use of new technologies in business and in the society has brought Lithuania to one of the top 20 locations in terms of easiness of doing business in the world (World Bank Report, 2005). However, it failed continuously to attract FDI and induce effective international linkages.

The period 2004-2006 has brought first round of EU SF aid for Lithuania. The measures aimed to achieve the major policy goal – industrial competitiveness – and foster development of innovations in the business sector via direct and indirect grants. The distinctive feature of this period is the parallel development of business and innovation support infrastructure and innovations in business sector. The implementation of the measures is closing in 2008.

The major policy document, defining implementation of EU Structural funds in Lithuania was a Single Programming Document. The state aid was provided under the four major themes – energy and infrastructure, human resources, industrial competitiveness, and upgrade of rural areas, agriculture and fishery. The first programming period featured with relatively low investments in human resources compared to infrastructure and energy sectors. The measure “Improvement of Business conditions” (LT20), with € 4 232 thous aimed at the development of SME support system (LT31), Innovation support system (LT32), Development of Science and Technology parks and Technology centers (LT33), development of industrial zones (LT34), associated business structures and clusters (LT35), implementation of environmental measures in business (LT36) and improvement of the image of Lithuanian products and services internationally (LT37). The measure of “Direct support for business” (LT21), with € 87 710 thous aimed at the modernisation of enterprises and innovation development (LT22), improvement of quality management and implementation of TQM (LT23), support for the internationalisation of companies, implementation of industry standards (LT24), etc., development of clusters, networks and partnerships (LT25), implementation of environmental measures in enterprises (LT26). All these measures should be aimed at the development of entrepreneurship and business in Lithuania. The third grant scheme under the same measure “Direct support for enterprises” with € 15 410 thous fostered the development of technological innovations in enterprises and R&D in business sector, co-operation between R&D and Business sectors (LT28).

The ministry of Education and Science implemented measure “Improvement of the quality of human resources for R&D and innovation” (LT30), where € 34 975 thous aimed to improve quality of highly skilled human resources in the priority areas of Science and Technology development– biotechnology, agriculture and forestry, mechatronics, laser and optical technologies. Ministry of Social Security and Labour implemented measure “Development of labour force competencies and the ability to adapt to changes”(LT38). The main objective of the measure was to increase the competitiveness of businesses across the whole Lithuanian economy through investment in training and skills development to help employees adapt to labour market changes and the rapidly evolving skills needs of employers. Specific objectives were to bring the training of specialists at all levels into line with the changing needs of the economy; to raise the qualification and knowledge level of the employed population; to strengthen social partnership and to introduce new forms of work organisation in companies such as flexible working practices, part-time working etc. € 39 333 thous. in the period of

2004 – 2006 were allocated for implementation of training, retraining and skills development programmes aimed at employees in industry and business companies as well as in public sector; diffusion of training, retraining and skills development programmes aimed at employees in industry and business companies as well as in public sector; Implementation of on-the-job training and apprenticeship in industry and business companies as well as on farms; Development of social partnership; Introduction of flexible work and work organization arrangement methods; Development of population competence in the ICT field; Retraining or upgrading of qualifications for the population living in the areas lagging behind or undergoing essential transformation of economic activities (e.g. Ignalina NPP region) and privatisation of state enterprises.

In the first programming period the structural funds have systematically addressed the needs for knowledge and innovation infrastructure development.

The new mix **of measures for innovation and R&D development** was designed for the new programming period of 2007-2013. However, the implementation of the new measures is still delayed, and only few measures started yet. The measures, related to innovation and skills development are grouped along the two large operational programmes - “Operational programme for the Economical Growth for 2007–2013 (Research & development)” and “Operational programme for Human resources”.

The largest part – 45.72% – of total EU SF resources will be allocated for the “Operational programme for the Economical Growth for 2007–2013 (Research & development)”. The new set of measures is designed with the aim to respond to the main innovation challenges, identified in the NRP (2005) programme, number of policy studies (...) and also in this document. The policy mix is grouped along two broad priorities: “Research and development for competitiveness and growth of the economy” and “Increasing business productivity and improving environment for business”. The first priority group responds to the need of increase R&D capabilities in both – business and R&D sectors, and also establish linking mechanisms between the two in order to facilitate higher value added innovations in business.

Measures of priority 1 “Research and development for competitiveness and growth of the economy” are directly designed to support the development of innovative capabilities in business and strengthen innovation infrastructures. €677.3m will be directed towards research and development for business competitiveness, of which €386.4m will directly target the long term investments on R&D: €74.3m for R&D in research centres; €241.6m for R&D infrastructure, including enterprises and technologies, computer networks between research centres, and technology competence centres; €70.5m for business R&D support, including research performed at the R&D centres. The research capabilities, absorptive capacities, networks for innovation will be facilitated by the group of measures, discussed below.

In order to strengthen business R&D, and also adjust public sector performed R&D, the measures will cover the two steps of R&D activities - feasibility studies on R&D projects with the aim to reduce risks, related to the R&D development (Idea LT (Idéja LT)) and actual implementation of R&D projects and development of research infrastructures (IntelektasLT, (limited to SME’s only) and IntelektasLT+ (for large R&D projects and developments).

The development of knowledge intensive clusters across the public knowledge poles was taken as a central activity in order to support creation and rise of innovative companies. The new measures related to the development of innovative clusters with the original R&D and partnership infrastructures will be implemented in the programming period of 2007-2013 (Innocluster LT and Innocluster LT+).

In order to ensure the development of supporting structure for the new and existing innovation activities, the existing business and science sectors partnership and cooperation infrastructures, such as technology parks, technology platforms, technological business incubators and intermediary institutions will be strengthened with the implementation of measures “InogebLT-1” and “Inogeb LT-2”. The measures are specifically aimed at strengthening (InogebLT-1) of these structures, and internationalisation (Innogeb LT-2) of them. Specific measures are addressed towards the development of innovative capabilities of firms - those are the measures under the InogebLT-2.

Measures of priority 2 “Increasing business productivity and improving environment for business” aim to facilitate other than R&D based innovative activities in firms. The measure LyderisLT will support technology investments, or other type of investments that will increase the productivity of enterprises and develop new products that will open the export markets. The measure E-verslasLT will support development of e-business applications in all Lithuanian industries and services. The measure ProcesasLT aims at the improvement of industrial and business processes, i.e. – organisational innovations.

The new market related opportunities will be opened with the measures Invest LT and New opportunities”. Measure InvestLT aims to create industrial investment zones in order to attract FDI to Lithuania, and specifically – knowledge intensive industries. As noted in the previous section of the report, Lithuania failed in a long term to attract dynamic FDI, especially in the production sector, and also lost the ability to profit from international partnerships, advanced know how and lost the opportunity of integration in international production and technology chains. As the Baltic Sea Cluster Study shows (Institute of Business Strategy, 2006), Lithuanian production integration in the international clusters remains rather limited. FDI is related to the development of new opportunities for Lithuanian production enterprises. Also, it is seen as a tool to exploit more efficiently the qualifications and skills existing in the country, but not fully exploited by the current industrial structure.

On the other hand, the new opportunities for the internationalisation of Lithuanian enterprises will be developed via the support for search of the new markets. Most of the Lithuanian enterprises, regardless of their position in economy and technology sophistication are still domestic market oriented, or - if exporting, than as a second option if the domestic market fails. There are only few internationally thinking and acting enterprises. However, the small markets, especially declining during the recession period will force companies either to reduce production capacities (shut down) either to improve products and qualities and search for the new markets. The measure “Naujos galimybės” (New opportunities) will aim at the international market research and design of the programmes of the internationalisation of the markets of Lithuanian enterprises.

The assistance for innovating enterprises will be further strengthened. The measure Asistentas-1 aims at the increase of the quality and variety of public services in innovation consulting, measure Asistentas-2 aims at the development of business incubators and the creation of creative industries business incubators and Asistentas-3 aims at the development of the international image of Lithuanian producers and attract FDI to Lithuania via publicity campaigns and targeted projects. All the assistance measure will be implemented by the public institutions, no access for private companies will be provided.

The involvement of R&D sector in innovation policies will be facilitated via the initiatives of the Ministry of Higher Education and Science. The new initiatives to foster university knowledge transfer for industry will be implemented in 2007-2013 with the General National Complex Programme (2007) and National R&D and Science and Business Partnership Programme (2007). The measure worth to mention within this report is the establishment of integrated science, study, and business centers (valleys) (started in 2007) which is aimed at the development of integrated knowledge circulation infrastructures, where the R&D knowledge would be tightly linked to the NTB firm creation and highly skilled human resources development processes. R5 such valleys are established already – 2 in Kaunas, 2 in Vilnius and 1 in Klaipėda.

The more proactive approach has been also taken regarding business R&D investment. The Investment Promotion programme for the 2008-2013 (Government Resolution no 1447 of 19 December 2007)² was approved, which seeks to create an environment favourable for investment in high value added sectors. The tax incentives for business R&D and education investments were also taken.

²<http://www.ukmin.lt/en/investment/legislation/1447-2007-12-19%20Investiciju%20skatinimo%20programa%20EN20080314.doc>

New financial mechanisms to promote new ventures and reduce risks of business innovation related activities were designed under the Operational programme for the Economical Growth for 2007–2013 (Financial engineering and related measures). The controlling fund will be established in order to provide micro credits for SME's, support the new ventures, especially new technology based firms via the provision of venture capital funds. Interests of guaranteed business loans will be partially covered under the same measure, as a tool to promote further business investments and development. The interest rates of sustainability projects will be covered as well in order to support business investment in environmental technologies and sustainable development. These are the projects that do not directly contribute to the productivity of business, but are aimed at the sustainable development.

The life long learning processes and researchers skills will be improved via the set of measures of the Human resources development programme, priority 2 "Life long learning" and 3 " Strengthening the skills of researchers".

2.2.2 New or significantly changed innovation policy measures

The new set of innovation policy measure was approved in 2008, which opened the 2007-2013 SF implementation period. The designed measures are replacing the measures that were active until 2008 and covered the programming period of 2004-2006. The new set of measure was designed with regard to the National Reform Programme (2005) and National Structural Funds Implementation Strategy for 2007-2013.

The new policy mix is described in the section above. This section will concentrate on the short presentation of new measures introduced. The new measures related to the innovation development covers R&D development, business innovation processes, business investments and internationalisation, innovation and venture funding, development of skills for innovation and life long learning initiatives.

Only few of them started in 2008, as presented in the table below. The implementation of the rest of foreseen measures is still pending.

Exhibit 4: New Innovation Policy Support Measures

IPM N°	Title	Innovation policy framework category	Organisation responsible
	Idea LT (Idėja LT)	2.3.1 Direct support of business R&D (grants and loans)	Ministry of Economy, Business Support Agency
	Intellect LT (IntelektasLT)	2.3.1 Direct support of business R&D (grants and loans)	Ministry of Economy, Business Support Agency
	Intellect LT+ (IntelektasLT+)	2.3.1 Direct support of business R&D (grants and loans)	Ministry of Economy, Business Support Agency
LT66	Leader LT (LyderisLT)	4.2.3 Support to technology transfer between firms	Ministry of Economy, Business Support Agency
LT67	The improvement of human resources in enterprises	.3.1 Job training (LLL) of researchers and other personnel involved in innovation	Ministry of Social Security and Labour, European Social Fund Agency

The measure Idea LT aims to increase the R&D activities in the private sector. It supports the preparation for the implementation of R&D projects in enterprises, to perform feasibility studies and thus reduce risks of such activities. The supported action is the preparation of the planned R&D project related feasibility studies and risks assessment.

The rationale of the measure is to promote R&D projects in SME's, and support their actions in technology progress, since many of them are postponing R&D projects because of the lack of understanding of their real risks, and expected costs/benefits ratio.

The measure Intellect LT has the same aim as the previous one - to increase the R&D activities in the private sector, but targets directly the investments in the R&D related to the development of innovative products, services and processes. The R&D performance is supported, but not the investments into the innovation production processes.

The measure Intellect LT+ specifically targets the development of enterprises and the creation of new ventures by the investments in R&D infrastructure and the support for the creation of the new work places for R&D personnel. The only investments into the existing or new established enterprises R&D infrastructure are supported without the funding for R&D projects as such (measure Intellect LT specifically targets this issue).

The measure Leader LT (Lyderis LT) supports the increase of productivity in enterprises. The aim of the measure is to support the investments if the enterprises, that would increase the productivity and open new export opportunities, and also support the launch of the new production. The material investments (except buildings) as well as the intangible investment into the acquisition or upgrade of technologies and related internal engineering infrastructures are supported.

The measure "Improvement of human resources in enterprises" aims to improve the qualifications of the employers and managers of the enterprises, and increase their abilities to adapt to the enterprises needs and labour market changes. The actions support are: training and improvement of qualifications (i.e. education activities that led to the acquisition of new formal qualifications), improvement of skills and abilities, the development of individual plans for the qualification development, related to the training course implemented in the enterprise, the development of modern personnel management systems, implementation of new forms of work organisation, including flexible time, part time and the like, sectorial studies on the demand of qualifications.

2.2.3 Trends in innovation policy at regional level

Lithuania, as a mono region country, has no regional innovation policy implementation practices. The Regional Innovation Strategies were developed in order to design strategies for the actors in regions on how to use and implement effectively national innovation policy actions.

The regions were provided with more power in decision-making on regional development with the SF EU-supported programme of Cohesion support actions. Regions are provided with the decision power to decide on the most important cohesion needs of each region. Among many others, the measure of "Development of Regional Economy growth centres" will be implemented, by its nature, the measure aims at the development of modern economic infrastructure, increase the attraction of the locations for businesses and inhabitants.

2.2.4 Focus sub-theme: Policies in support of creativity and innovation

We are increasingly observing a trend for innovation policies to "intrude on" neighbouring areas such as education and skills in order to unlock/mobilise other sources of innovation. It is therefore interesting to investigate if and how Member States are implementing policies in support of innovation and creativity (precisely, where the two meet). This is **not** about the creative industries or policies in support of artistic creativity *per se*. It is more about horizontal policies, such as:

- awards for design and innovation;
- policies to unleash the creativity of user groups;
- policies in support of design;
- policies in support of trademarks (see also EIS-indicator)
- general awareness raising on creativity and innovation
- policies in support of urban creative clusters (a creative region/cluster may be defined as in Richard Florida (2005) "Cities and the Creative Class", Routledge. New York, revolving around the 3T's of economic growth: Technology, Talent and Tolerance)

- entrepreneurship and design

Governments and regional authorities in several countries see creativity as an important driver for increased competitiveness and growth. The need for policies in support of creativity is also perceived as crucial in this regard. In many countries, there are programmes set up specifically to promote creativity and innovation. Such programmes may be carried out by existing actors (for example a government agency), or new actors may be set up to run them.

This year's theme will provide an overview and analysis of the existing mix of policies in support of creativity and innovation and programmes in Lithuania at *national and regional* level.

Creativity only recently became a part of innovation policy debate in Lithuania, as a consequence of international learning and new research studies carried on in relation to the innovation and creativity. The importance of creativity in the innovation process is explicitly stated in the MoE programming study "Innovation development in business: strategic priorities and actions (2007)"³, where innovation in business is defined as the creative risk taking change oriented and culturally embedded process, in which knowledge is transferred into the competitive products and/or services. The broad goal for Lithuanian Innovation policy set in the study is to create preconditions for innovations to become the core competitive force in business. The study suggests the goal should be implemented according to the four broad priority lines: the development of effective institutional and regulatory innovation environment, the development of innovation competence in business, the development of innovation culture and strengthening of collaboration and interactive learning based linkages. The programming study should lie at the core of new Innovation in Business programme, which is still not designed yet.

In the meanwhile, the creativity development remains at the bottom up initiative level. The traditional types to enhance creativity and innovation, such as innovation prizes, are present for almost 5 years in Lithuania. The traditional Innovation prize competition, carried on since 2005, consolidates the efforts of enterprises for innovative activities. However, crossing the borders of traditional technological innovation within this contest happens rarely. The companies compete on the categories of innovative product and innovative enterprise.

The similar initiative is established by the Knowledge Economy Forum, an independent think tank. The rewards of "Knowledge Economy Company of the year" are organized from 2004. Rewards for conquerors entrust the President of Lithuania Valdas Adamkus. The aim of rewards of "Knowledge Economy Company 2008" is to evaluate and honour the most prosperous knowledge economy companies and to encourage them to be the excellent examples for Lithuanian economy. The rewards of "Knowledge Economy Company 2008" are granted for the most innovative and progressive companies in three different sectors:

- the most progressive high-tech sector company,
- the most progressive traditional industry company,
- the most progressive service sector company.

According to The Knowledge Economy Forum Board's set selection criteria's Organizational Committee rate the companies' achievements in the knowledge economy area.

In 2008 the rewards were given to the companies bendrovės „Norta“, „BIOK“ ir „New Vision Baltija“. The laser sector company group from this year has established a specific prize for the most successful young high tech company, which this year was given to the enterprise „Mobiliųjų sprendimų centras“.

The more systemic approach towards the creation of innovative clusters, creative regions, etc., is only at the initiation stage, and, as noted above, of bottom up type. The most comprehensive work, performed in this area is associated with the implementation of the research project supported by the Lithuanian State Science and Studies Foundation "Activating citizen's participation in creating knowledge and learning city by developing innovative culture" (2003-2007). The aim of the project was to substantiate the premises and models of citizens' participation in creating a "knowledge and

³ Taikomojo mokslinio tyrimo darbas – programinė studija „inovacijų versle plėtra: strateginiai prioritetai ir veiksmi“. LIC, 2007.

learning” city by developing innovative culture. The project continued for four years. The project performed multidisciplinary research on the following:

- Innovative culture situation among the individuals and organisations, and its premises, with specific learning city factors among them.
- Grounding the most effective models of innovation implementation.
- The ways a purposive learning-in-partnership network affects the activation of citizens’ participation and their receptivity to innovation.
- Patterns of cooperation in a multidisciplinary area among researchers and professional practitioners attempting to create common knowing.
- Features of a learning organization detected in business, industrial, and other organizations of a city facilitating the formation of innovative culture and participation of employees in the development of an organization.
- Factors blocking the formation of innovative culture and employees’ participation in business, industrial, and other organizations and the ways to overcome these agents.

Research was carried out in Kaunas, Šiauliai, and Utena, the cities which are developing / aim at developing into the learning ones.

Although the project was of a scientific type, the empirical base for the development of “learning cities” was created, and the new initiatives were started. The municipality committed to the development of learning city as early as in 2004, with the municipality decision to approve the project “Kaunas - the Learning City”, when the idea came from the scientists of Kaunas University of Technology. Today Kaunas belongs to the PASCAL EUROPEAN NETWORK of LEARNING REGIONS (PENR3L) with the aid of the EUROPEAN COMMISSION SOCRATES PROGRAMME, together with other 44 network members.

Other Lithuanian cities have not such a comprehensive approach towards the development of creativity within them, but few innovation policy measures are related to their development. On 21 March 2007 the Government of the Republic of Lithuania adopted the Resolution No. 321 on Approval of the Conception of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) (“Valstybės žinios” (Official Gazette), 2007, No. 40-1489) (hereinafter the Conception), providing for the possibility of the development of the Integrated Science, Studies and Business Centres (Valleys) which would facilitate in creating in Lithuania the science, studies and knowledge-economy clusters of the international level, accelerate the development of the information society and strengthening long-term basis of competitiveness of the Lithuanian economy. The Conception recognises that scientific research and higher education capacity building, promotion of their linkages and consistency with economic and public needs is one of the key factors of competition.

5 such valleys are at the establishment and the first development stages so far. The concept of the valley integrates the interested actors into the common concept of innovative clusters – regions, municipalities, R&D and higher education institutions, businesses, public institutions and NGO’s. The locations and thematic focus of the valleys was selected according to the competencies concentrated within certain locations, and specific development needs, related to the national economy and the specific location. The analysis of the submitted valley visions shows that the closest to the concept of creative city are the Vilnius located valleys – the Sauletekis valley and Santara valley. Both of them are going to be suited in the specific city locations, where already some networking, cooperation and joint knowledge creation culture exists. The other valleys, to be developed in Kaunas (2), and Klaipeda (1) seems to be executing more traditional approach of the development of R&D infrastructure and strengthening R&D capabilities. Little is said in their visions on the processes that will facilitate the development of highly knowledge intensive clusters.

2.3 Innovation policy and competitiveness: main conclusions

2.3.1 How well does policy respond to innovation challenges?

Lithuanian Innovation policy response to the challenges identified in a more systematic way has been designed since 2004, with the Single Programming Document of 2004-2006, the implementation of which is closing in 2008. The new set of measures, designed for the period of 2007-2013 can only be evaluated ex ante, as the implementation processes in the case of the most measures did not start yet.

The policy response to the challenge of **improving skills for innovation and entrepreneurial attitudes** is complex and covers two lines of actions – development of highly skilled workforce, and also upgrade of the qualifications of the researchers, and an upgrade of qualifications of working population with the aim to provide modern skills for knowledge economy (including management and innovation). The system of qualifications, development of qualifications of highly skilled labour force in the priority areas (Science and technology, and horizontal skills – entrepreneurship, management, innovation and science and technology management) was targeted by the separate measures. All of those were operated under the Single programming document for 2004 – 2006 and co-financed from the European Structural funds.

The new set of measures was developed for the period 2007 – 2013, however their implementation is still pending. The action programme “Development of Human Resources” has a set of measures, specifically targeting the challenge:

Under the priority 1 “Quality of employment and social security” the measure “Improvement of Human Resources in Enterprises” targets the upgrade of qualifications of the employed population, including the professionals and managers.

The life long learning issues will be targeted by the set of measures under the priority 1.2. “Lifelong learning”. The innovation related challenges particularly will be addressed with the measures “Improvement of the efficiency of the study system”, and “Provision of the highest quality of formal and informal education services”.

The priority 1.3 “The improvement of the skills of the researchers” consist of the set of measures, particularly targeting the development of R&D capabilities in Science and Business sectors. The measures “Development of the specialists of highest qualifications”, “The improvement of the qualifications of scientists and other researchers” will directly contribute to the innovation skills within enterprises, and also science sector.

The “Economy growth action programme” has a set of measures with the direct target to improve know how and innovation process related knowledge in enterprises, also the operational market knowledge. The measures “Leader LT”, “E-business LT”, “ProcessLT”, “New opportunities” and “Assistant 1” aim to develop the role leaders in new technology based and traditional industries, develop and improve the e-business applications for Lithuanian industries, develop innovative processes and new ways of market access for enterprises, with the provision of direct assistance and training of related skills. The measures „Inogeb 1” and “Inogeb2” specifically target the development of innovative skills within the public innovation support institutions and enterprises”.

In this way, the challenge will be addressed in three ways: development of comprehensive skills for innovation and entrepreneurship through the education processes, design of organizational innovations, and qualitative consulting.

The impact of the measures for the economy is too early to evaluate, but success of their implementation is high – in terms of competition among projects and absorption rates. Key indicators in the period 2004 – 2006 have improved significantly – the gap in a life long learning between EU and Lithuania has decreased by 18 percentage points. The measures and intentions oriented towards life long learning are showing the first results. The measures oriented at the development of new

qualifications are too early to evaluate, as the first programming period mainly addressed the design of new programmes and development of new learning tools for highly skilled.

The challenge of **Building R&D capabilities in firms and development of sound R&D base** is partially addressed by the measures identified in the response description to the first challenge, but also has a specific set of measures to be implemented. Measures are of the wide coverage, and the main risk of the implementation is not achieving the significant scope in all the areas. Although the mix is relevant to tackle the problem, the complexity of the issue demands high concentration of resources and co-ordination of activities, which will be hardly achieved without political intervention and high level co-ordination. Such co-ordination occurs in certain areas. Namely, Biotechnology Committee and Laser Committee were established in order to align various actions fostering development of Science, R&D, Competencies and Industries in entire technology areas. The R&D capabilities in firms in the programming period were implemented according a few targets:

- Development of priority new technology fields and traditional industries (High technology development programme, Industrial biotechnology development programme, Support for R&D in enterprises - applied research and development (SPD measure 3.1.7)
- Development of conditions for FDI with a knowledge and technology transfer component (Development of industrial zones, facilitation of greenfield investments (SPD measure 3.2.4)
- Development of R&D infrastructure. Investing in modern equipment for research organisations, upgrading competencies in Science and technology of highly skilled, promoting joint-research projects and mobility of researchers to the private sector (Improvement of the quality of Human Resources for R&D and Innovation (SPD measure 2.2.5), Development of labour force competencies and the ability to adapt to changes (SPD measure 2.2.2)).

The period of 2007 – 2013 will feature a broader spectrum of measures, targeting the development of R&D capabilities, as defined already in National Reform Programme in 2005. The two action programmes, namely the programme of Human resources development” and “Economy growth action programme” has sets of measures aimed at the development of the complex R&D capabilities. The “Economy growth action programme” under the priority 1 “R&D for the competitiveness and growth of the economy” offers a comprehensive set of measures targeting the supply and demand side for R&D. The supply side will be strengthened via the implementation of measures, administrated by the Ministry of Education and Science, and targeting the public science sector development:

- R&D infrastructure development
- Development of high level R&D and competence centres
- Development of national open access science and information communication centres
- Implementation of science programmes and other R&D projects

The demand side will be strengthened by the measures, administrated by the Ministry of Economy, and aiming at the direct involvement of enterprises in R&D. The measures of the group are offering opportunities to perform feasibility studies for R&D projects (Idea LT), perform R&D in house or jointly with the R&D institutions (Intelektas LT and IntelektasLT+).

The challenge of **Development of knowledge intensive clusters across public knowledge poles** was initiated with the initiative of the Ministry of Education and Science to develop integrated Valleys of Science, business and Studies. As presented in previous section, the valleys aim to integrate and consolidate the efforts of public science sector and knowledge intensive companies for the development of R&D based innovations. The previous measures related to the development of S&T parks, technology platforms will be continued in order to consolidate already existing efforts in the development of partnerships of science and business sectors. The new measures, related to the development of scientific networks under the priority of “Human resources development will address the networking processes in R&D sector, namely, the “Development of R&D thematic networks and associations”. The demand driven knowledge intensive cluster development will be further strengthened by the new measures Inoklaster LT and Inoklaster LT +. The first tackles the initiation of knowledge intensive cluster, R&D performance by the cluster companies and related actors, marketing of cluster activities and attraction of the new members. The second measure, Inoklaster LT + will further support the development of clusters via the investment sin to the development of cluster oriented R&D and learning infrastructures. The measures, targeting the clusters development and presented above were approved together with all new programming period of 2007-2013 related

measures in 2008, but their implementation is still pending. There is no empirical evidence on the performance and impact of the measures except of ex ante. The implementation success will heavily depend on the success of the measures, addressing the first two challenges identified in the report.

Exhibit 5: Summary table: innovation challenges, policy responses and impact

Challenge	Relevance of policy response	Evidence of impact
Improving skills for innovation and entrepreneurial attitudes	4	3
Building R&D capabilities in firms and development of sound R&D base	4	3
Development of knowledge intensive clusters across public knowledge poles	4	3

Policy response ranking scored from 1 to 5: (1) No specific measures addressing the challenge (possibly a debate but no evidence of any real policy development); (2) Policy development under way to respond to challenge (policy debate or design launched, e.g. announced in National Lisbon Reform Plan, etc.); (3) Specific measures existing for some time but insufficient to respond fully to challenge; (4) Existing measure plus one or more newly launched measures (during last 18 months); (5) A comprehensive set of measures which potentially responds fully to the challenge.

Evidence of impact scored from 1 to 5: 1. Trend for indicators has worsened since measure(s) introduced; 2. No observable change in trend since measure(s) introduced; 3. Too early to appraise (measures introduced in last 24 months); 4. Trend for indicators has improved since measure(s) introduced; 5. Evaluation or study indicates measure(s) has clearly contributed to improving performance of country.

The set of policy responses to the challenges identified above offers a range of policy triggers to move the economy towards knowledge and innovation based competitiveness. The actual situation in the economy is also positive to changes offered, since the companies rapidly are realising that traditional sources of growth are gone. In addition, the expected increases of energy prices after the Ignalina power plant shut down in 2009, forces the companies to think on the alternative ways of competition than costs. Of course, the set of measures offered requires the systemic actions and consolidation of competencies and resources, human and financial, negotiation and consensus finding among the interest groups. The strategic focus and consolidation of industries, businesses, science sector and governance will define the success rate of the policy mix implementation. The bottom up initiative to ensure the innovation based growth is starting in November 2008 – the Competence Network for National Competitiveness and Innovation – with the aim to rise broad high level discussion and achieve coordinated actions between public and private organisations, R&D institutions, the government and other economy actors for the common goal of national competitiveness.

2.3.2 Lessons learned from policy evaluation and good practice

The policy evaluation and good practice identification in Lithuanian case is a complicated process because of the non existing evaluation culture. The first attempts to evaluate the existing practices were made with the evaluation of Innovation in Business programme. Public audit report on Innovation Development in Lithuania was performed by the National Audit Office of Lithuania, and published in May 2008. The audit provided overall evaluation of the policy mix, which is quite unfavourable. The key statements of the report are as follows. In the opinion of the National Audit Office of Lithuania an efficient innovation promotion system has not been developed in Lithuania; investments to scientific, experimental, and innovative activities are scarce. This may have negative consequences for the long-term development and growth of Lithuania's economy. Such a conclusion was presented by public auditors who had evaluated development of innovations in the country. The Auditor General Ms. Rasa Budbergytė pointed out that Lithuania's objective to raise expenditure for scientific research and experimental activities up to 2 per cent of the GDP is very ambitious, since in 2005 this expenditure amounted only to 0.76 GNP. According to the Auditor General, implementation of this goal would require centralization of management of innovation development and introduction system, as well as drawing up of legislation regulating the system. Furthermore, it is necessary to envisage additional measures encouraging business companies to more invest into scientific, experimental, and innovative activities.

In Lithuania there is no general legal act covering innovation development system which would define innovation development policy and strategy in Lithuania, goals, rights, and duties of all the legal

entities participating in innovation process, as well as connections among elements of all the system, the established supervision and coordination of implementation of measures, and incentives system of innovation development.

Commission on Science, Technology and Innovation Development coordinating this activity is passive, and does not coordinate and manage dynamically innovation development process. Information on the activities of the Commission is not published.

Investments of Lithuanian enterprises into scientific, experimental, and innovative activities were small; the enterprises were not interested in investing and showing in their accounting investment costs. Enterprises willing to invest into scientific experimental and innovative activities, as well as innovative, but untested, risky, and expensive projects so far have very limited chances to receive additional financing which is necessary for carrying out of their projects, because risk capital funds are still at the initial stage of performance.

There were no good practice measures identified in the audit, neither such exist in practice. Each measure implemented had some positive impacts, but also struggled because of the inability to achieve significant volumes, implementation quality, etc. Relatively better performed and absorbed are measures aimed at the Improvement of Human Resources for Innovation and Life long learning initiatives. The first reason of the popularity of the measures is related to the very limited financial resources that public education (including higher education) institutions receive for the performance of functions. Despite, the quality standards are set high. In this way, the organisations are forced to look for the additional resources, which can only be received via the competitive targeted funding. Business enterprises have much broader variety of options to select in order to achieve development targets than the public funding, which is evaluated as being very limited, complicated and resource consuming in administration, therefore in many cases rejected as an option by business enterprises.

2.3.3 Possible orientations for future policy actions

In the recent period Lithuania has made a tremendous progress in innovation policy making and implementation, to a major extent due the Lisbon process and implementation of NRP. Structural funds gave a real base to implement and sustain a wide range of innovation support measures, both in public and private business domain. Although the success of the implementation of measures is too early to appraise, and no new trends in EIS indicators appear, the current stage of play gives positive hope for the future.

The set of measures implemented has intensified orientation of enterprises towards innovation, especially those, having capabilities for R&D based innovations, modernisation of enterprises via innovative actions, and development of business and innovation support infrastructure. The new policy focus could be intensified on:

- creation and development new technology based firms, intellectual activity based entrepreneurship in all sectors of the economy. The provision of the tolls and sense of ownership in the creation of new business models in the economy needs to be given for the younger S&T professionals generation in order to ensure the intellectual resources are not wasted in the mid skill oriented careers.
- Development of innovation and creativity culture in all sectors of the economy, but also in the society, which is still very weakly addressed.
- Development of the creative spaces for the rise of new generation of high valued added ventures.

3. Thematic focus: support for innovative start-ups, including gazelles

Innovative start-ups are seen as important vehicles for economic growth. Without business conditions that facilitate the creation of business start-ups, the contribution of investment in science and technology to innovation and growth will remain limited. New technology-based firms are significant employers of scientific and engineering personnel and key actors in the innovation process. These conditions may include well-functioning venture capital markets, regulatory reform to enable greater entry and exit and a business climate stimulating risk taking in the creation of new innovative firms.

In this section we are therefore investigating the role of policies to support innovative start ups in the national innovation system.

3.1 General framework condition for innovative start-ups

Lithuanian Business Conditions, according to the World Bank Doing Business 2009 report, were ranked 28th in the world with no changes to the previous year. However the starting business rank dropped from the position 54 in 2008 to 75 for 2009. It requires 7 procedures, takes 26 days, and costs 2.72 % GNI per capita to start a business in Lithuania. Other unfavourable trends for the new growing business continued – the difficulties to get the construction permits increased (rank 63, change in the position -6), the rank of employing workers dropped from 128 to 131, getting credit became more complicated (global rank 43, drop in position – 3). Other indicators of starting and doing business in Lithuania also slightly worsened. According to report, there were no positive changes in favour for start up. There is no definition of what is an “innovative start-up” in the Lithuanian business regulation, thus there are no specific legal conditions. But, having in mind the higher risks of innovative start-ups, it faces specific problems in getting credits, loan guarantees, and even the management of human resources, which remains the main obstacle for the development of innovative businesses. The legal regulations are very strict and rigid in terms of the forms of employment, regulation of the work hours, hiring and firing, and the like. The flexible employment forms, essential for the new project based enterprises, do not exist in Lithuania. In addition, the international mobility of workers is strictly regulated and associated with the high costs to the enterprise if the employees have to work internationally. Therefore the business enterprises take a lot of caution while developing human resource strategies, associated with the growth and internationalisation of enterprises.

Getting credit for an innovative venture is almost impossible because of the conservative behaviour of banks and non-existing techniques to evaluate the risk of an innovative project. Venture capital funds also don't exist in Lithuania, thus the new technology based innovative enterprises are forced to turn to international venture capital funds. However, the lack of negotiation skills in such ventures is an important obstacle for the economically positive outcome of such co-operations (the KEINS research results, 2007).

The long term measures of the Ministry of Economy for promoting the creation of innovative firms are limited to the support of the firms placed in Business Incubators and Science and Technology parks. The business incubators are primarily oriented towards the regional development goals (such as a creation of new businesses, growth of employment) with limited focus on innovation, unless this is defined in the Regional Development Strategy. The only business incubator with technological profile in Lithuania is the Kaunas regional Business Incubator. Technology parks, located in the main cities of Lithuania support the development of NTB firms. Their impact to the development of the knowledge intensive sector is too early to evaluate since the most of the enterprises remain in the 1st stage of growth.

The other measures related to the entrepreneurship include sustaining and development of the network of Business Information centres, which are not dealing specifically with an innovative start ups, neither have such competencies. The Lithuanian Innovation Centre is the main agency supporting such ventures with the targeted consulting projects.

3.2 Specific policies and programmes for innovative start-ups

There are no specific policies or programmes for innovative start ups in Lithuania. They have access to the whole policy mix described in the section 2.2.1 if eligible for funding because of their status and size. In many cases the start up companies are in less favoured situation than the others, as they can not show the positive track records from the past. Many of the support measures are requesting to show the positive balance at least for the two past years.

The key infrastructure to promote their growth is the S&T and Business Incubators, as presented in the section 3.1.

New financial mechanisms to promote new ventures and reduce risks of business innovation related activities were designed under the Operational programme for the Economical Growth for 2007–2013 (Financial engineering and related measures). The controlling fund will be established in order to provide micro credits for SME's, support the new ventures, especially new technology based firms via the provision of venture capital funds. Interests of guaranteed business loans will be partially covered under the same measure, as a tool to promote further business investments and development.

The initiatives to promote innovative start ups are limited to the Business plan contest (<http://www.versloturnyras.lt>), educational measures and the private initiative "Gazelles" (www.vz.lt/gazele) – the competition for the title of the fastest growing SME's and related business training initiatives (conferences and books).

The other initiatives, related to training., development of competencies, etc. are of general character, and not essentially innovative start ups oriented.

3.3 Integration with other competitiveness policies

There are no measures exclusively dedicated to the promotion of innovative start-ups. Most of the operated schemes are aimed at improving the framework conditions for businesses in general, or are targeted at the needs of SMEs. But in most cases innovative start-ups can particularly benefit from the advantages of the programmes. This could be seen as an "integration" of competitiveness policies, i.e. complex programmes providing incentives for a wide range of businesses, not just young and innovative ones. However, as noted above, in several cases the lack of a meaningful distinction between innovative and non-innovative firms and the disregard for the different needs of firms in different stages of their development can result in inappropriate allocation criteria and insufficient consideration of the varying needs and challenges faced by innovative start-ups.

Annex: Sources of further information

Annex 1: Websites of key innovation organisations

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