

# RESEARCH OF TECHNOLOGY TRANSFER PROBLEMS IN LITHUANIA

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Lithuania has already become a real member of the European Union, where the priority and the aim are knowledge of economy and technology innovation policy. Lithuania is far away from the other EU countries and the other candidate countries developing technology knowledge together with entrepreneurship. So, this fact promotes the deeper analysis of technology environment as the anchor of technological innovations and encourages foreseeing its further development in Lithuanian.

The promotion of innovation is implemented by developing business incubators, science and technology parks in Lithuania. Now Lithuania has 7 business incubators, 6 science and technology parks. Here the enterprises have administrative services, renting, and technical support on favourable terms.

**Keywords:** *technology transfer, technology parks*

## 1. Introduction

A process in which new ideas are applied to create value for society is innovation [4]. Research and Technological Development (RTD) are an essential element in the functioning of innovation system in the EU member states. Who should collaborate together that ideas would come practicable?

The technological innovations within closely cooperation between business, science (knowledge) and governmental institutions don't guarantee its successful integration into multiform systems (business, society) or its continued use. Lithuania has a lot of problems with transferring and diffusion of new technologies. It proves the statistics of European innovation [15, 17].

The study of innovation and technology transfer models is rapidly becoming a popular line of study in the technology systems research. Academicians, business managers, IT managers and other commercial organizations have benefited significantly from this line because the result is value-added.

Universities are not normally known for their entrepreneurial attitude and flair. They are recognised, however, as major knowledge and research centers. I would argue that for many start-ups it is becoming vital to link into a university as soon as possible [10].

The ever changing perception of the roll of technology in our society provides educators with a myriad of challenges and problems for the curriculum [7]. After study programs analysis of electronic engineering the result was that bachelor students don't have disciplines like development of technologies, technology adopting and transferring, innovations, and technology management. What is the most important in the studies programs: knowledge or application? Maybe it should go together with mixed disciplines? The article is very important for Lithuania Technology Universities Society, because the system doesn't work right. Besides Lithuania future begins from the focused brains (knowledge) and that determine the level of Lithuania technology society.

**Research object** – innovation and technology transfer system in Lithuania.

**Research objective** is to show main weakness of Lithuania innovation and technology transfer system.

**Research tasks** set out achieving the objective:

- 1) Analysis of innovation and technology transfer models;
- 2) Other countries experiences analysis.

**Research methods** applied - the logical analysis and synthesis of scientific literature and European Union reports, the systematic analysis of statistics, and the comparison and generalization method.

## 2. The Problems of Innovation and Technology Transfer

The main problems of Lithuania technology sector are stated in United Nations report [18]:

- Experts noted, that though development of technology proceeds and Lithuania has achievements in the fields like lasers or biotechnology, however these cases are rare;
- Although Lithuania has enough resources for innovations but interaction between universities and business is casual and not controlled process. It should be noted that economics of Lithuania is based on small and medium business. Small and medium business doesn't have so good possibilities like huge international companies to use knowledge.

- The business environmental changes influence particularly a small business. The government should make better circumstances for academic institutions and business interaction.

Technology transfer problem in Lithuania primarily shows European Union statistics in the technology and innovation sectors (Table 1). In all categories the indexes don't reach average of European Union [15,17].

On the strength of 2005 summary innovation index (SII) of European Union countries can be divided using hierarchical clustering in the following 5 groups (Figure 1) where Lithuania position isn't very attractive for our society [3]:

1. Group-1: CH, DE, FI, SE
2. Group-2: AT, BE, DK, FR, NL, AT, UK
3. Group-3: IE, IT, LU, NO
4. Group-4: BG, CZ, EE, ES, HU, LT, LV, PT, SI
5. Group-5: CY, EL, PL, RO, SK

The Summary Innovation Index is composed of two main groups, Innovation Input (Innovation drivers; Knowledge creation; Innovation & entrepreneurship) and Innovation Output (Application; Intellectual property) [15].

The components of summary innovation index are the key how to solve technology transfer problems in Lithuania. The most important subjects who can determine SII are University and Enterprises. However, it works when government creates an environment for researches (science) and business to come together.

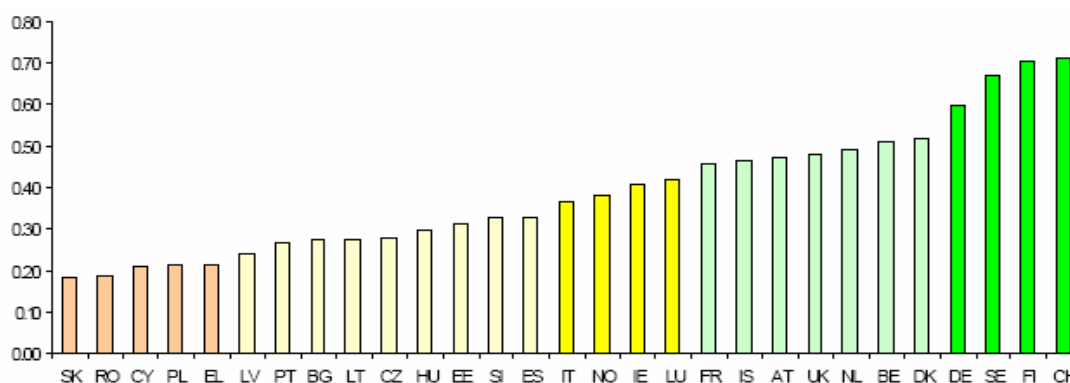


Figure 1. Plots the SII based on April 2005 data availability

Source: European Innovation Scoreboard 2005

**Table 1.** Lithuania and EU innovation's statistics

Index	Year	Lithuania	EU average	Degree of uneven
Summary Innovation Index – SII (points)	2004	0,26	0,44*	Large
Summary investment level to R&D (% GDP),	2003	0,68	1,94	Large
✓ public R&D expenditures	2003	0,54	0,67	Large
✓ business R&D expenditures	2003	0,14	1,27	Large
The number of researchers per thousand of the working force	2004	4,0	5,68**	Large
✓ in the enterprises (%)	2004	6,7	49,7**	Large
Employed in medium and high tech manufacturing (percent from the total workforce)	2003	3,03	6,60	Large
Employed in medium and high tech services (percent from the total workforce)	2003	1,66	3,19	Large
The number of patents applied to EPO (per million population)	2002	2,6	133,6	Large
The number of patents applied to USPTO (per million population)	2002	0,5	59,9	Large
The goods manufacturing per employee, 1000 EUR/during the year	2003	31,9	169,7	Large
Value-added per employee, 1000 EUR/during the year	2003	9,7	45,1	Large
Labour productivity (per person employed) (ES-25=100)	2004	49,8	100	Large

\* EU-15 index; \*\* 2002 y. Source: "European Innovation Scoreboard"

### 3. Innovation and Technology Transfer Model in Lithuania

The scientific literature notes three main models of technology transfer and adopting [12] but full existence of them in Lithuania is questionable. This topic shows the main reasons why Lithuania doesn't have fully operative technology transfer system. Models of technology transfer and adopting:

**I. Direct:** University – Industry. Does it work? No...

Lithuania enterprises are not concerned to invest in technology’s development and adopting. The proposition demonstrates the statistics of European Union [17] where Lithuania indexes lag from ES average in the all fields. The direct model of technology transfer (University – Industry) in Lithuania doesn’t exist because:

- 1) Business R&D expenditures make a 0,14% of GDP meanwhile EU average is 1.27%;
- 2) The number of researchers per thousand of the working force in the enterprises (%) are 6,7% meanwhile EU average is 49,7%.

**II. Intermediaries:** University - Science Park – Industry. Does it work? No...

The activity of Science Park is undoubtedly positive. The main problem of these institutions is: the enterprises working here are not entrepreneurial. Technology Parks are devoted to develop business and science connection, the enterprises, which have the specialisation in science research and development sphere are engaged there.

Technology transfer and innovation support services in Lithuania [11]:

- ✓ Lithuanian Innovation Centre, with 5 representatives across Lithuania;
- ✓ Science and Technology Parks:
  - Vilnius
    - North Town Technology Park
    - Science and Technology Park
    - Visoriai IT Park
  - Kaunas High and Information Technology Park
  - Klaipeda Science and Technology Park
  - Šiauliai University ST Park
- ✓ Sunrise Valley Initiative
- ✓ Technopolis Initiative
- ✓ Kaunas Regional Innovation Centre

For example we can present Aston Science Park in the United Kingdom, the city of Birmingham [1]. Birmingham technology aim is to create wealth and employment by providing facilities for the establishment and rapid growth of knowledge based companies that can benefit from the business support services, management skills of BTL (Birmingham technology Ltd.) and interaction with other companies within Aston’s business community. On 5 hectares space are located: Aston University, Banks, Birmingham Business Information Centre, Operating Cornerstones (market rents, flexible licenses, flexible management, range of unit sizes, functional common areas, security and access, scope for fitting out), Business & Innovation Centre, Venture Way Units, Enterprise Way Units, Holt Court Units, Priestley Wharf and etc.

Three core function [19]:

- ✓ Incubation of tenant companies;
- ✓ Delivering programmes to our and wider community;
- ✓ Consultancy.

**III. Intermediaries with Business Approach** (New firm creation) University –incubator/open lab - science park – Industry. Does it work? No...

The basic aim of business incubator is a stimulation of new companies founding and creation of a consultancy support environment with maximum opportunities of “survival” and development of new companies [14]. However, the activity of incubators is undoubtedly positive like science parks.

Lithuania has incubators, science parks, and open laboratories though they are in the developmental stage. So at this moment the best fits model of technology transfer system for Lithuania could be (2 Figure):

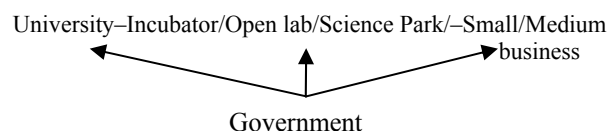


Figure 2. Innovation and technology transfer model of Lithuania

- 1) Incubators;
  - Incubators put it all together [4]: 1) Specialists, seminars and forums; 2) Business plan development;
  - 3) Finance and accounting; 4) Marketing and promotion; 5) Banking; 6) Sales techniques.
- Now Lithuania has 7 business incubators: Vilnija, Kaunas University of Technology, Telsiai, Alytus etc. [14].

Should be technology engineer a lecturer, a business planer, accountant, marketing and banking specialist too? Do we have study programs about technology management in Lithuania? Today manager can't solve engineer problems, but engineer can't solve manager problems. So this is the answer why incubators are necessary and why we need universal specialist Technology planers and managers.

Brain drain problem is especially important in Lithuania. It arises because of small salaries, existing immigrant nets abroad, the perspective to live in more developed countries do also. So the state policy must be very effective in this case. Employees should have opportunities to create entrepreneurial innovative enterprises, to carry out scientific research. The propagation of the activity of business incubators could serve to this end.

## 2) University;

The Lambert review talks: "It is important for students, particularly science students, to develop entrepreneurial skills to allow them to exploit innovation and develop the commercial potential of their work" [13]. I have analyzed the studies programs of electronic engineering and the result was that bachelor students don't have disciplines about development of technologies, technology adopting and transferring, innovations, and technology management. The studies programs should have mixed disciplines: Technology – Law – Management. Then student will gain entrepreneurial skills and that will allow them successfully to manage technologies in the enterprises.

Individual characteristics, managerial capabilities and skills are the core success elements in technology adopting [2]. So education and learning become especially important. Lithuania has created a lot of various learning programs devoted to technology, but they often lack effectiveness, the connection between the needs of business organisations and the students' qualification. The gap between knowledge supply and demand should be reduced, learning and education should be promoted, creating financial support possibilities. The creation of carrier centers in enterprises should be promoted, and the lifelong learning must become a daily occurrence. Today in Lithuania a high school diploma is necessary even for not qualified work. Entrepreneurship is one of the ways in which unemployment problems could be solved.

Lithuania is backward from the most of the EU member states in computerisation and the level of information technology is used. Efforts are made, but Internet makes difficulties for small enterprises and population because of high cost. This is the main problem [17]. Information technologies are needed for knowledge dissemination, for example, for distance learning. International standards in the sphere of electronic commerce are not developed and it is the main problem in business sector.

## 3) Small and medium business;

Recent Lithuanian legal acts show that small and medium-size enterprise policy becomes most important. In Lithuania small and medium-size enterprises comprise about 80% of all the enterprises [16]. Most of these enterprises function in Vilnius and Kaunas regions, because there is a well-developed business infrastructure. Changing legal acts, bureaucracy, imperfect tax system and its administration problems remain the main ones to the small business. The United Nations recommends Lithuania to develop financial services for small business [18]. Such conditions should be created for entrepreneurial enterprises so that they could use credits on favourable terms, risk capital funds, the insurance of loans, EU structural funds support. The common enterprises should be also promoted.

Setting up a successful start-up company In Lithuania is increasingly difficult. Growing a start-up to a size at which it can compete on the global market is only achieved by a happy few. The product life cycles are getting shorter and shorter. It is near impossible to stay ahead of the technology curves. Competition from China and India is increasing – the Global Entrepreneurship Monitor report (2005) suggests 205 million aspiring entrepreneurs in India and China are waiting to pounce [8].

## 4) The Role of Governments;

So is there a role to be played by the government? In Lithuania, many of the important Technology transfer and innovation support services were established as a result of government funding. Small research grants from industry can help hundreds of small interdisciplinary projects to flourish, but there is also a critical need for larger bulk funding to develop a cohesive scientific community [9]. Bottom-up identification of scientific agenda through proposals from individual scientists is critical, but when these can be fostered in an environment of concentrated funding, research communities will develop more readily.

## 4. Other Countries Experiences

Lithuania doesn't have a big industry and there are no companies like "Microsoft", "Volkswagen", "Fiat", "Sony" which have possibility to invest in researches and to create high technology laboratories themselves. The best brains leave our country generally after studies or early (the last year Lithuania lost ~18,6 thousands of population [16]) and Lithuania loose all possibilities to adopt high technologies. The government must stop this negative process. First of all Lithuania should stop the departure of best brains directly in the university. The solution is other countries experience like Scotland.

### Scottish institute for enterprise

Set up 1999 to promote university enterprise education/commercialization of science, technology, and engineering. Mechanisms include:

- ✓ Employ 2 staff in each University to:
  - Deliver courses outwith curricula;
  - Work with staff to embed enterprise in curricula;
  - Support/advise student start – ups (currently about 90 per year);
- ✓ Prepare teaching material (case studies etc)
- ✓ Train staff (2003/4 - 133)
- ✓ Student business plan competition (with support courses): 2003/4 430 entries;
- ✓ Employ two students part – time to set up enterprise society, run events, student magazine etc.
- ✓ Student patent fund (2003/4 - 12).
- ✓ Master classes, events, national student enterprise conference etc.

Remit widening to include creative industries, professions (5,6).

### Scotland's Enterprise Fellowship Scheme

Assistance of university researchers in selected technologies commercialize their technology via academic spin out. Funded by development Agency, administered by Royal Society of Edinburgh provides year salary (£21,000/£31,000) and up to 5k expenses via bi-annual competition:

- ✓ 60% of year on developing technology;
- ✓ 40% on business education/ start up (specialist university provided MBA);
- ✓ Mentor, access to network (venture capital etc);
- ✓ Application needs good science/technology, statement of technology development needs and market potential/ideas;
- ✓ Held University.

Since 1997 launch, 70 completed Fellowships, 50 new companies (many set up by team including Professors with Fellows as Director) [5].

### Conclusions

1. The problems of Technology Transfer are difficult and as varied as the organisations involved in the process.
2. The problem primarily shows European Union statistics in the technology and innovation sectors where Lithuania in all categories doesn't reach average of European Union.
3. The main problems in Lithuanian innovation sphere are: there is not any global managerial system of innovation activity, the promotion mechanism of innovation development is not effective enough. Enterprises lack financial resources for innovative activity, very often they are short of information. Information about business incubators, science and technology parks must be disseminated. Undergraduate students should be encouraged to create entrepreneurial enterprises under favourable conditions. The research made in the universities should be promoted guaranteeing their financing and the commercialisation of the results.
4. Lithuania has created a lot of various learning programs devoted to technology, but they often lack effectiveness and brain drain problem is becoming really serious.
5. The analysis of the situation leads to the conclusion – the penetration and development of technology system in Lithuanian depends on its policy rationality and co-ordination, the striving of the country to become competitive EU member in implementing innovations.

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