



## COLLABORATION OF BUSINESS AND SCIENCE: A STARTING POSITION FOR LITHUANIA'S MOVE TO RADICAL ECONOMIC CHANGE

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**Abstract.** The concept of interaction between systems of research, teaching and practical businesses in the context of knowledge-based economy and management are presented in the article. The article shows how the general trends of the global knowledge-based economy can be adapted to conditions of Lithuania. Special attempt is made for analysis of bridging local business and academic problems, solutions of which are relevant to Lithuania in the context of knowledge and globalization. In this context special attempt is made for developing new business strategies which play roles of key drivers in moving Lithuania's economy towards radical knowledge-based economic changes.

The paper attempts to make proposals for generating and effective use of synergy effects through establishing science & technology parks, business incubators, transport hubs and innovation research centers near universities which sponsor and help to spread an innovative culture amongst businesses in Lithuania. Special attempt is made to accent academic and business collaboration as priority and starting position in the process of the creation of knowledge-based economy in Lithuania.

**Keywords:** knowledge economy (KE), knowledge management (KM), competitiveness pillars (KP), research and development (R&D), knowledge cluster (KC), entrepreneurship (E).

**JEL Classification:** O52.

## VERSLŲ IR MOKSLO BENDRADARBIAVIMAS LIETUVAI ŽENGIANT RADIKALIŲ EKONOMINIŲ PERMAINŲ LINK

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**Santrauka.** Straipsnyje žinių ekonomikos kontekste analizuojamas mokslo, verslo ir mokymo ryšys bei jų pažangai aktyvinti skirtos infrastruktūros plėtojimo klausimai, parodoma, kad tokios infrastruktūros plėtra – esminis šiuolaikinio pasaulio ekonomikos modernizavimo prioritetas. Analizuojamos pasaulinės, žinių ekonomikos tendencijos ir jų taikymo galimybės Lietuvoje. Speciali vieta skiriama vietinio verslo ir mokslo tendencijoms bei jų tarpusavio sąveikos tyrimui, siekiant pateikti pasiūlymus efektyviam vietos verslo ir mokslo bei tiriamojo potencialo naudojimui. Akcentuojama, kad sėkmingai plėtojant inovacijoms ir mokslo bei technologijų pažangai skirtą infrastruktūrą, ypatingas dėmesys turi būti skiriamas infrastruktūros, mokslo ir technologijų parkų, verslo inkubatorių, inovacijų ir transporto centrų, kitų panašių organizacijų steigimui, jų tarpusavio sąveikai, parodoma, kad tokių organizacijų plėtra sudaro realias prielaidas į vieną sistemą integruoti šiuolaikinių tyrimų, universitetinių ir neuniversitetinių studijų, tradicinio praktinio verslo potencialą, o tai savo ruožtu sudaro prielaidas įvairiais

pavidalais generuoti ir tobulinti inovacinę šalies verslo kultūrą, tam reikalui sėkmingai pritaikant sinergetinį efektą. Straipsnyje rodoma, kaip šios priemonės leistų sėkmingai spręsti tarptautinių ryšių plėtojimo ir konkurencingumo tarptautinėse rinkose stiprinimą globalizacijos sąlygomis.

**Reikšminiai žodžiai:** žinių ekonomika (ŽE), žinių valdymas (ŽV), tyrimai ir plėtra (TP), žinių klasteris (ŽK), verslumas (V).

## 1. Introduction

Processes of business and science collaboration via creation of knowledge economy are analyzed in many scientific works and could be defined as a system of interaction between different institutions (Goeransson, Soederberg 2005; Huseman, Godman 1999; Lahti 2007; Melnikas *et al.* 2000; Melnikas 2008a, b; Melnikas, Samulevičius 2010; Samulevičius, Samonis 2005, 2006; Samulevičius 2006a, b, c, 2007, 2008, 2009).

New methods of strategic management and competitiveness-boosting networking based on knowledge management are presented in the article. The main strategy is the strengthening of Lithuania's knowledge economy via collaboration of knowledge intensive business and science.

*The aim of the article.* The paper aims at emphasizing the importance of bridging science and business together having a target to show Lithuania's move to knowledge institutions such as integrated business centers, transport hubs, and also to present the vision and the challenges of these projects and institutions.

*Research objective and methods.* The researcher attempted to approach the subject using statistical and institutional research couched in the analysis terms as well as using a modified Harvard-style Lithuania's case study. The researcher also attempted to study actual empirical/practical processes, as they have been experienced in transition economies such as Lithuania thus bringing important evidence and empirical insights into the subject of the analysis.

*Research results.* The bridging science and business together via creating a network of knowledge institutions and projects is a wave of future, which represents new science and business opportunities and sponsors to realize "latecomer's advantage" by leapfrogging to the technologies and models of doing business in Post Communist and other emerging market countries, which are new for Western countries as well.

## 2. What do we know about new nature of business, competitiveness and tendencies of knowledge economies development?

Knowledge is a power. In today's era of knowledge-based economies, constantly changing business environments, severe competition and globalization, gaining the knowledge edge will greatly empower organizations to stay on the cutting edge. Technological developments in the 21st century have transformed the majority of wealth-creating work

from physically-based to knowledge-based. Technology and knowledge are now the key factors of production. With increased mobility of information and the global workforce, knowledge and expertise can be transported instantaneously around the world, and any advantage gained by one company can be eliminated by competitive improvements overnight. The only comparative advantage a company will enjoy will be its process of innovation—combining market and technology know-how with the creative talents of knowledge workers to solve a constant stream of competitive problems and what is important that we have ability to derive value from information. We live now in information society where a knowledge economy and knowledge management is essential (Enterweb 2012). This paper aims at emphasizing knowledge-based economy and knowledge management in the new information society.

Knowledge-based economy is constantly renewed by competitive economy of new knowledge, the core of which is to apply new knowledge in economic processes.

The success of knowledge economy depends on the interaction between national knowledge basis and innovation systems. Development tendencies of knowledge-based economy in different countries and regions are variable. The authors of scientific research maintain that the USA is a cradle of knowledge economy and forecast that the same development trends will continue till 2020. According to an expert, Japan is one of the leading countries in knowledge-based economy. But the following question arises: at what level is the EU? (The global trends 2015).

The aim of the Lisbon Special European Council of 23–24 March 2000 was to invigorate that EU should become the most competitive and dynamic knowledge-based economy in the world. The implementation of the Lisbon Strategy provided for developing research and innovatory enterprises by creating innovations in all fields of human activities, by creating and using new technologies, by promoting competition, by supporting education, improving the social policy and consolidating the free market. Looking at the current region of European development trends it seems that the initial implementation of the Lisbon strategic goal was difficult, that is why in 2004 it was reassessed and the goal was revised. That strategy was based on three main directions of the development: research and innovations was the main propeller of the growth for Europe having target Europe to become more attractive to investors and businesses. This could be done by consolidating the social

model of Europe, which was based on a general activity and a larger social community. The social science in Europe needs well trained scholars, the resources of time and equipment to gather data, skills and tools in order to analyse the multifaceted information and finally, the social science needs willingness of policy makers to listen to the evidence and to conclusions of social scientists for the ability to communicate its findings for solving local problems which arise from global context.

### 3. Knowledge-based economy creation process: the challenges for Lithuania

Lithuania also formulated its purposes. The Government and Council for National strategy approved the Lithuanian information community strategy of development till the years 2010 and 2030. The following directions can be distinguished: competence of the population and the social community, the resumption of public administration and knowledge-based economy. To ensure a rapid development of knowledge economy, it is important that macro-economy should be stable and strong. A national political consensus was reached and the national agreement was signed calling for Lithuania to become a knowledge-based economy. The term “knowledge economy” has been coined to reflect the increase in importance of knowledge as a critical factor for economic performance. Lithuania together with researchers in different European countries was prepared for developing collaboration and scientific synergy in areas where European scale and scope are required to reach the critical mass necessary for top-class science in a global context.

The decision was made, that further development of the knowledge economy infrastructure (e.g. better access to high-speed Internet) is needed. That will necessitate a better public sector-private sector collaboration so as to arrive at innovative management models and strategies underpinning the knowledge economy in Lithuania.

Europe has recognized Lithuania as the prime transport centre in the region linking the EU and the East (Fig. 1). Therefore country is prepared to become a part of two EU priority transport corridors: West – East and South – North.

North – South direction: I corridor (the VIA BALTICA highway and the RAIL BALTICA railway), connecting Tallinn – Riga – Saločiai – Panevėžys – Kaunas – Kalvarija – Warsaw; and I A corridor (Tallinn – Riga – Šiauliai – Tauragė – Kaliningrad); East – West corridor: IX corridor, IX B corridor branch (Kiev – Minsk – Vilnius – Klaipėda) and IX D corridor (Kaunas – Kaliningrad). These corridors are as a key for an effective development, safe and environmentally friendly handling of the increasing amount of goods going East – West and North – South. Moreover, it helps to enhance sustainable transportation and smart IT solutions in the field of transport. As a result, these corridors stimulate the economic growth and business development.

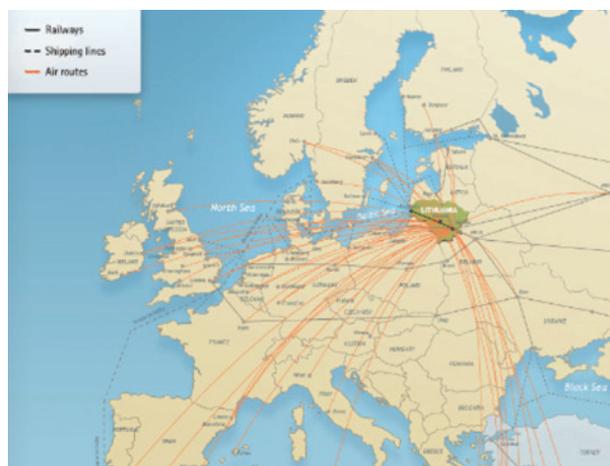


Fig. 1. EU's prime transport hub and interconnection of international transport corridors (Air, rail, sea and highway routes)

Source: [www.investlithuania.com](http://www.investlithuania.com)

Having a target to gain ranking and competitiveness, government has set a strategic goal for Lithuania to become the Northern Europe Service Hub by 2015–2030 with the share of exports of services making approximately 1/3 of Lithuania's total exports and 1/3 of total FDI in Lithuania settling down in the service sector.

### 4. Lithuanian geopolitics, business environment and infrastructure as a key driver of Lithuania's move towards dynamic and knowledge-based growth

After two decades of the post-communist transformation and large scale experimentation with the European integration, Lithuania needs to speed up and modernize the economy to arrive at viable 21st century global models. The big challenge before the country therefore is how to target the entire globe as Lithuania's current or potential market in order to induce entirely new perspectives and create many more advanced opportunities for the young, newly educated people. In case these problems are not solved in time, many of them will emigrate and thus condemn Lithuania to further transitional threats in its development on Europe's periphery.

#### a) Strategic European location and infrastructure.

Having in mind that the French National Geographic Institute has concluded that Europe's geographical centre is situated 26 km North of Vilnius (this is now registered in the Guinness book of World Records), Lithuanian business market is very easy to access, because of the geographical proximity, which can serve for incubation of new technologies. Moreover, location of the country, which imagines its business opportunity to beat the crossroads of such three huge markets as EU (Western Europe and Scandinavian), BSR (The Baltic Sea Region Innovation Network) and Eastern market (Russia and CIS (Commonwealth of Independent

States)) in which more than 700 million customers operate, creates opportunities for companies to expand their competitive edges moving their activities out of the region generating 'spread' of technological innovations globally (Fig. 2).

Moreover, Lithuania is a member of the international organization and unions such as World Trade organization (2001), European Union (2004), NATO (2004) and Schengen (2007). Therefore Lithuania ensures free trade between numerous markets, gets possibility to provide for customers more choices and broader range of products and qualities, and most importantly stimulates economic growth. Moreover, these memberships allow Lithuanian access to developed markets at the lower tariffs and ensure free traffic flow at internal borders. Additionally, country gets international support and cooperation. And finally, membership makes it easier and cheaper to do business in other countries and helps to expand and develop its own business market and environment. Additionally, Lithuania avails itself of the strategic European location by its infrastructure.

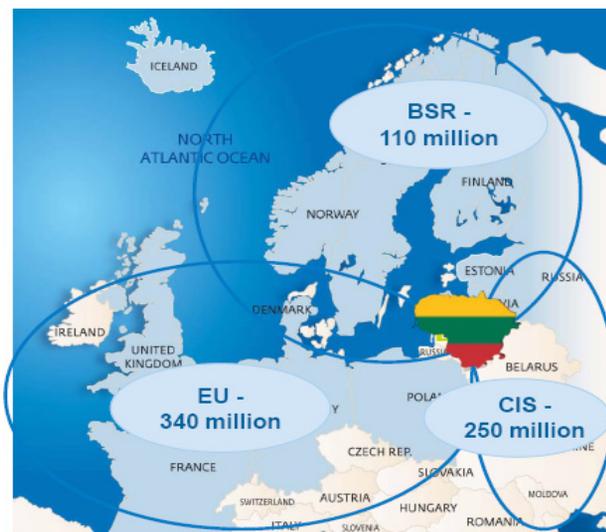


Fig. 2. Lithuania on the crossroads of the three huge markets. Source: [www.investlithuania.com](http://www.investlithuania.com)

#### b) Challenges for Lithuania-target 2030.

The chief criterion for Lithuania, before becoming a full member of the EU, was the capability to withstand the European competitive pressure and become competitive and visible in globalizing world. While in the first period lower labour costs do provide certain competitive advantages pretty much across the branches of economic activity, this factor was of rather short duration in the case of Lithuania or other transition economies. Lithuania's transition to a free market economy has been facilitated by structural reforms and an increasingly vibrant private sector. Along with policies that open the country to global commerce and trade, competitive taxation and well-designed regulatory system have contributed to a more dynamic

and broadly based economic expansion. Lithuania has been recovering gradually from the sharp economic contraction.

Lithuania's strategy was to develop higher added-value market niches that will precisely call upon the Lithuanian capabilities to create an entrepreneurial economy that is integrated continentally and globally. Knowledge economy provides such opportunities especially in the context of knowledge and innovation in the European and global business. The main goal was strengthening of Lithuania's knowledge economy having a target to catch up and surpass Western Europe in terms of dynamism. For that purpose scenario 'Lithuania – 2030' was developed, where new challenges of values and challenges to the leadership were chosen as a priority (Kubilius, Chalmers 2011; Lithuania... 2011; Lithuania 2030). People not technologies were priorities. In this scenario dynamism of the people was chosen as a prerequisite and dynamism of technologies was chosen as a destiny. Having in disposition dynamic and highly skilled talent pool: 30% of overall population with higher education, compared to the EU average (24%), 50% of speaking two foreign languages, 49 higher education institutions (22 universities and 27 colleges), 7 universities and 8 colleges hold IT curriculums, 40% of talent in science and technology, with leading in the world position in mobile e-signature, highest fiber optic density in Europe, world's fastest upload to Internet in 2009, exemplary GSM penetration and densest network of public Internet access points in Europe, Lithuania is a spring board to the single European market counting over 500 million consumers as well as to Eastern markets (Kubilius, Chalmers 2011; Lithuania... 2011; Lithuania 2030). Moreover, Lithuania's Economic freedom score of 71.5 is making its economy the 23<sup>rd</sup> freest in the 2012 Index. Its overall score in the year 2012 was 0. points higher than in the 2011, with significant improvements in labour, fiscal and monetary freedom offset to a large extent by serious decline in the score for government spending. Lithuania was ranked 11<sup>th</sup> out of 43 countries in the European region, and its overall score was well above the world and regional averages. Strategic location and market share helped for Lithuania to become one of the strongest countries among Baltic States. Comparing all three Baltic States' market share, Lithuania has a world of difference from Estonia and Latvia. It comprises more than 50% and is bigger two times than Estonia's and three times than Latvia's market share. The growing number of investors from 2000 till nowadays has not decreased. It has been growing all decade and now approximately 4000 investors are investing in Lithuania. The major countries-investors are Sweden (~12%), Poland (~11%), Denmark (~10), Germany (~10%), Netherlands (~7%), Estonia (~7), Russia (~7%), Finland (~5%), Latvia and Norway (~4%). The growing number of investors show that Lithuania becomes more and more attractive for new business and business ideas implementation (Grigaitė 2012). As it is seen from (Table 1) Lithuania is evaluated as moderate competitive country.

**Table 1.** Gross Competitive Index of Baltic States (Global competitiveness report 2011–2012; Grigaitė 2012)

	Lithuania	Latvia	Estonia
GCI rank	4.3	4.06	4.56
Institution(1)	62	66	29
Infrastructure(2)	43	61	40
Macroeconomic environment(3)	73	93	21
Health and primary education(4)	46	49	26
Higher education and training(5)	26	34	23
Goods market efficiency(6)	64	60	29
Labour market efficiency(7)	54	47	16
Financial market development(8)	89	60	41
Technological readiness(9)	34	46	27
Market size(10)	79	95	100
Business sophistication(11)	54	71	53
Innovation(12)	48	59	30

So, Lithuania is evaluated as moderate competitive country. In this competitive score basic requirements and 12 pillars underpinning national competitiveness and revealing macroeconomic state are included (Global competitiveness report 2011–2012; Grigaitė 2012).

- The institutional environment (1) is the first pillar determined by the legal and administrative framework within which individuals, firms, and governments interact to generate wealth. This pillar became even more apparent during the economic crisis, because it influences investment decisions and the organization of production and plays a key role in the ways in which societies distribute the benefits and bear the costs of development strategies and policies. Comparing this determinant among three Baltic States, it is clearly seen that in Estonia there is proper management and trust in the national business environment, which creates wealth. On the contrary, in Lithuania and Latvia – there are more barriers, and members of this institutional environment can not ensure trust in the national business development and its processes (Global competitiveness report 2011–2012; Grigaitė 2012).
- Extensive and effective infrastructure (2) is critical for ensuring the effective functioning of the economy, as it is an important factor determining the location of the economic activity and the kinds of activities or sectors that can develop in a particular instance. Lithuania and Estonia have quite well - developed infrastructure, which reduces the effect of distance between regions,

integrating the national market and connecting it at low cost to markets in other countries and regions. In addition, the quality and extensiveness of infrastructure networks significantly impact economic growth and reduce inequalities and poverty in a variety of ways (Global competitiveness report 2011–2012; Grigaitė 2012).

- The stability of the macroeconomic environment (3) is important for business and, therefore, it is important for the overall competitiveness of a country. Estonia is one of better macroeconomic environment examples, comparing with Latvia and Lithuania, and could be specified as a country in which government provides services efficiently and has ability to react to business cycles (Global competitiveness report 2011–2012; Grigaitė 2012).
- A healthy workforce (4) is vital to a country's competitiveness and productivity: poor health leads to significant costs to business. Moreover, basic education increases the efficiency of each individual worker. Therefore the score of Lithuania and Latvia is a little bit less than that of Estonia, and it could be noted that Estonian workforce is more efficient and productive comparing with other Baltic States (Global competitiveness report 2011–2012; Grigaitė 2012).
- Comparing the fifth pillar (5) (higher education and training) Lithuania and Estonia have very good scores and economies of these countries could move up the value chain beyond simple production processes and products and most importantly are able to adapt rapidly to the changing environment and evolve needs of the production system (Global competitiveness report 2011–2012; Grigaitė 2012).
- Only Estonia could be labelled as a country of efficient goods market (6) and could be characterized as well positioned to produce the right mix of products and services given its particular supply and demand conditions, as well as to ensure that these goods can be most effectively traded in the economy. Moreover, such high rank shows that country has healthy market competition, both domestic and foreign. Therefore, in Lithuania and Latvia economies are disharmonious markets, in which business productivity cannot be ensured (Global competitiveness report 2011–2012; Grigaitė 2012). Labour markets (7) have the flexibility to shift workers from one economic activity to another rapidly and at low cost and also to ensure a positive effect on worker performance and the attractiveness of the country for talent. However, comparing all states, Lithuania is ranked the worst and loses workers' effectiveness, because workers are not allocated to their most efficient use in the economy and not provided with incentives to give their best effort in their jobs (Global competitiveness report 2011–2012; Grigaitė 2012).

- Evaluating financial market (8) development Lithuania is one more time ranked as the worst country among other Baltic States. Therefore the country does not have well functioning financial sector for economic activities and thus cannot properly make capital available for private sector investment from such sources as loans from a sound banking sector, well regulated securities exchanges, venture capital, and other financial products (Global competitiveness report 2011–2012; Grigaitė 2012).
- The technological readiness pillar (9) measures the agility with which an economy adopts existing technologies to enhance the productivity of its industries, with specific emphasis on its capacity to fully leverage information and communication technologies in daily activities and production processes for increased efficiency and competitiveness. According to rank of this pillar it is obvious that Lithuania and Estonia have ability to innovate and expand the frontiers of knowledge. Whereas Latvia cannot so fast react and adopt new technologies and has barriers in innovation development (Global competitiveness report 2011–2012; Grigaitė 2012).
- The size of the market affects (10) productivity since large markets allow firms to exploit economies of scale. Previous analyses showed that Lithuania is open and positively associated with growth (according to macro indexes). This conclusion is also approved by the tenth pillar – market size which shows country's possibilities to grow and expand, moreover, to be more competitive and attractive comparing with Latvia and Estonia (Global competitiveness report 2011–2012; Grigaitė 2012).
- Business sophistication (11) concerns two elements that are intricately linked: the quality of a country's overall business networks and the quality of individual firms' operations and strategies. According to this pillar's ranks Lithuanian and Estonian efficiency is higher, greater opportunities are created for innovation in processes and products, and more barriers are reduced to entry for new firms comparing with Latvia (Global competitiveness report 2011–2012; Grigaitė 2012).
- Innovation (12) is particularly important for economies as they approach the frontiers of knowledge and the possibility of integrating and adopting exogenous technologies. Thus Lithuania is evaluated as middle – ranked country and improves its productivity in several areas. However, this twelfth pillar is supported less by both the public and the private sectors comparing with Estonia. In particular, it means less investment in research and development (R&D), not so extensive collaboration in research between universities and industry, and the protection of intellectual property (Global competitiveness report 2011–2012; Grigaitė 2012).

Taking into account all these analyses, it should be noted that Lithuanian advantages are infrastructure, very good location and market features, additionally, the country has quite good technological readiness and business sophistication. All these determinants make country open, competitive and most importantly ensure the possibility for dynamic growth and expansion. However, some factors such as macroeconomic environment, labour market efficiency and financial market development affect the country negatively and tend to weaken Lithuanian business environment and attractiveness (Global competitiveness report 2011–2012; Grigaitė 2012).

Stable political and economic environment ensured by EU, NATO and WTO membership, Europe's prime transport center, innovation driven knowledge economy (global laser, biotech, IT leadership), top quality talent pool, competitive business operation environment are those predictable arguments which show that Lithuania is more than prepared for radical start in creation of innovative economy and a country creating innovations and added value for the entire world.

### **5. Strengthening of knowledge intensive business and education as a key driver for Lithuania's future growth**

The dominant challenge for Lithuania is how to use a considerable theoretical research (e.g. biotech, lasers, ITC leadership, nanotechnologies, semiconductors, game theory) potential of the Lithuanian research institutes, universities, and industry. There is a need to develop a practice-oriented strategy for knowledge-based industries. The biotechnology industry was one of a key allied industries in Lithuania, which has been developing since the 1990s and is regarded as one of the most sophisticated in Central and Eastern Europe. It is estimated that the sector employs 700 people, including 160 R&D employees, while its total annual revenues exceed 50 million EUR. The success of the Lithuanian biotechnology industry has been reinforced by the return of Lithuanian scientists who had spent over a few years abroad. However, the potential goes beyond this with a pool of 18,000 R&D researchers and specialists in Lithuania today. 15 research institutions carry out chemical and biochemical research on protein, enzymes and nucleic acid for pharmaceutical purposes, 16 institutions, including five major universities, train biotechnology and business specialists in cooperation with both domestic and foreign biotechnology companies.

Lithuania is known and proud of innovations and inventions by its researchers. Our mentioned laser technology is another key allied industry, which has placed Lithuania on the global map. The success story of Lithuanian laser technologies was driven by fundamental and applied research in the field of laser physics and technology conducted in Lithuania already for more than forty years, strong science and manufacture collaboration infrastructure, professi-

onal training and availability of high quality specialists. The Lithuanian laser industry firmly positioned on the global market, holds more than half of the world's market for high energy pico-second lasers as well as ultra-fast parametric light high-energy pico-second lasers as well as ultra-fast parametric light generators. The Lithuanian laser sector players export about 85% of their products to 100 countries around the world. The majority—three quarters of total production is sold in Europe and North America. However, the rapidly growing Asian market is another target for Lithuanian laser manufacturers. The Lithuanian laser industry is growing more rapidly than the global market: during period of 2003–2008, its sales increased by 140%, whereas the world wide laser technology sector went up by 45%. In the year 2003, 8% of total production was sold on the local market while in 2008 this index amounted to twice as much. In the long run Lithuania's laser industry presents attractive business expansion opportunities to foreign investors: long-term (since 1966) laser development and manufacture traditions, leading Lithuanian laser equipment competitiveness in international markets. World's first tunable wavelength laser NT200 produced by Lithuanian ISO9001 certified manufacturer of lasers, laser systems and components for R&D and industrial applications EKSPLA won the world's best Scientific Laser award at the prestigious 2010 Prism Awards for Photonics Innovation in San Francisco. Global leadership in transferring fundamental research into manufacture: 11 science and laser technology research centres carry out fundamental research. About 85% of production is exported to all continents. Annual sector growth of about 20% and largest share in value added created on the national market, one of the targets – best educated, most multilingual and highest quality talent pools. Currently 16 laser technology companies, employing over 450 highly qualified specialists operate in Lithuania. The number of employees increased more than twofold over the last five years. Every tenth Lithuanian laser industry professional holds a PhD. (The laser industry in Lithuania).

Educational institutions in European countries are still somewhat attached to the subject-based teaching/learning and this problem is therefore more pronounced in Europe than in North America.

Nowadays all over the world higher education and universities are preparing themselves for new status quo and challenges which are predicted by social and economic processes and new business opportunities. Looking to the trends in global higher education, private education occupies leading positions and is on the rise. The global education market amounts to more than 2.3 trillion USD, with around 15% in the developing world. Private sector participation is growing while government regulations are becoming more liberalized. At the moment private higher education market is estimated to be worth more than 350

billion on current expenditures alone and is growing further (Trends in global higher education...).

As concerns private sector of higher education in Lithuania, it is rather more than weak. Only 3% of university students study in private sector. Some competition appears when we look to the social sciences sector. Being more flexible, private institutions have a possibility to pay higher salaries and use foreign lecturers, even some subjects are possible to be bought from outside. In general, public sector of higher education in Lithuania is responsible for the most specialists available in the field of technologies, natural sciences, life sciences, humanities and arts. In the nearest future the competition between universities should not be local but global. From our point of view, public universities in the short run will be the most important driving force for competitiveness of Europe in the future.

At present there are 21 universities (state and private) and 27 colleges in Lithuania. The country is well above the EU average by the proportion of students per 1000 to the total population aged 20–29 (LT – 73.21; EU – 52.8) (Medvedeva 2011). Lithuania has switched over to the European model of higher education that makes a clear distinction between university and non-university studies. They are divided into undergraduate, graduate and postgraduate studies. The common time and workload framework allows for a bigger mobility of students and comparability of degrees and other higher education prospects. As concerns future of Lithuanian universities, they must be prepared for new challenges which are posed by the internationalization of higher education, aging population, global energetic, climate and macroeconomic changes. Solving these problems universities must be prepared to identify, detect, analyze and prepare recommendations for new business opportunities which are most feasible to invest in. Universities should be both initiators and leaders in this activity and have to develop new curriculum and tools, new learning approaches such as learning by doing or learning by developing, implementation of which can combine aspects of innovation in learning and business. Moreover, universities should be initiators or leaders of this activity not only in their local regions, but going international. On the agenda of higher education there is internationalization, cross-border education, different policy rationales and approaches to cross-border education, etc. At the moment number of international students in Lithuania is less than one percent. Therefore, most of Universities have to develop new policy challenges, new curriculum that applies to professors and students. Lithuania's higher education is still looking for a better model of regulation of universities, for improvements which could help Lithuanian universities to compete more successfully at global level. From this point of view many changes must come from inside of the universities. This is due to internationalization and the rapid exchange of information, via

programs for the mobility of academics, administration staff and students. Right now we have some achievements: Vilnius University has participated in the EU sponsored JOIMAN project related to the management of Joint Master Programs, also is a member of different networks such as EUA, IAU, UNICA, BUP, BSRUN, etc. Vilnius Gediminas Technical University was an active partner of the European research programs (6<sup>th</sup> and 7<sup>th</sup>) FRAMEWORK, PHARE, COST, EUREKA, NATO, etc. Mykolas Romeris University was a pioneer in establishing UNESCO organization of higher education (IAU) in Lithuania and the first University in Lithuania which changed its status to public body. According to WEB of World University ranking, the University of Tartu takes the first place among the Universities of the Baltic States (place 483 in the world) and Vilnius Gediminas Technical University comes second (place 634 in the world) (Ranking Web of World Universities 2012).

Nowadays all over the world universities must be prepared for new challenges which are predicted by rapidly changing socioeconomic processes. They must be prepared to identify, detect and analyze new business opportunities. It could well be that knowledge management is that vehicle and that frame of mind that can help support research networks, which are the lifeblood of the integration into Global research.

All these achievements show us that internationalization of higher education is demand-driven priority of leading universities in Lithuania, which can support emerging economies, developing and transition countries to build or strengthen their capacity of higher education.

Bridging science and business or academic collaboration is the new agenda and a new target of how to survive under conditions of uncertainty, we have in mind conditions of global recession.

## **6. Bridging science and business together: Lithuania's case study**

The theory-practice gap has been something of a problem inherited from the communist period, as are the inter-institutional collaboration shortcomings. One important aspect of that challenge is the interdisciplinary and cross-disciplinary nature of modern business models that mandates integrative thinking and puts a premium on those managers who are able to integrate functional perspectives.

In today's world, when we've already extended era of the zero-growth economy, separate market participants are unable to achieve good results which knowledge economy requires.

The key for solving problems are networks, clusters and other common activities (Melnikas, Samulevičius 2009). In the network of such knowledge institutions there are very popular objects of knowledge economy such as knowledge camps, houses, towers, islands, technological parks, valleys, transport hubs, etc.

Five integrated R&D centers (valleys) were established in 2007–2009, two of which are in Vilnius (Santara and Sunrise Valleys of electronics, nanotechnologies, ITT and biomedicine), two are in Kaunas (Santaka and Nemunas Valleys of ITT, mechatronics, chemistry and agriculture) and one Maritime Valley in Klaipėda.

These valleys, firstly, give possibility for access to skills and networking, i.e. concentration of scientists, researchers, developers and university academia, close collaboration of knowledge-intensive businesses with science and study institutions, opportunity to be co-located with other companies in the same sector (clusters) and region. Secondly, Lithuanians get advantages of research excellence i.e. open access labs, R&D projects supported by EU/state, application of research results in industry and business. Moreover, it ensures innovation and new technology development and comfortable conditions to establish new technology oriented businesses – offices, labs and business incubators. Finally, it helps to increase international competitiveness.

By developing valleys in Lithuania it is sought to create clusters of research, higher education and knowledge-based economy of an international level, to speed up the creation of knowledge-based society and to strengthen Lithuania's competitiveness.

Valleys in Lithuania are created seeking to concentrate, renew and optimize the infrastructure, which would enable state-of-the-art technologies and other most promising sectors of science, technologies and business to be developed, relations between scientific research and higher education to be strengthened, close interaction between scientific research, science, higher education and knowledge-intensive business to be ensured, as well as to engage in training researchers and other specialists.

Also, it is sought to develop scientific co-operation of the highest level on the national and international scale, to attract necessary foreign investments of great intellectual potential, and on the basis of research and higher education, as well as knowledge-intensive business to create clusters of knowledge-based economy.

Knowledge economy clusters are successfully created near Universities in different countries. Our neighbours-Nordic countries are developing very successfully towards this direction. In recent years Finland and Sweden pooled their resources for R&D especially in the last decade that influenced growth of high-tech level of production in exports of those countries. Technological parks "Kista" and "Technopolis" are well known knowledge economy clusters all over the world. The neighbouring country Poland also has great achievements in this field of activities. Poland is successfully developing 45 ha square Technological Park "Techno port" near the capital Warsaw. Good conditions for successful activities started in Vilnius "Sunrise Valley" where special social enterprise "Sunrise Valley" in May of 2003 was established.

“Sunrise Valley” in Vilnius is one of innovative centers, which was deliberately modeled after the Silicon Valley, California, where “Eastman Kodak”, “General electric”, “Intel Fairchild”, “Lockheed”, “Hewlett Packard” and other companies started and developed their activities.

Vilnius University and Vilnius Gediminas Technical University, well known Lithuania’s corporate leaders: ALNA, SONEX, OMNITEL, BITE GSM, EKSPLA, Laser Research Institute, the members of the Knowledge Economy Forum of Lithuania were founders of this public unit. In February 2004 Vilnius City Municipality became a stakeholder in public company “Sunrise Valley”, EKSPLA Ltd. transferred its authorities as “Sunrise Valley” stakeholder to Association of Laser and Photonics Science and Business Institutions in July 2005. Association unites nine Lithuanian R&D institutions and business companies.

In reality “Sunrise Valley” accumulated theoretical and practical potential of the best Lithuanian research Institutes, Universities, think tanks, consultants, firms and organizations and is ready to tap into the growing stock of global knowledge and adapt it to local needs. The overall aim of creating “Sunrise Valley” cluster is to contribute to the growth of wider global economy and will serve for developing of Lithuania’s worldwide competitiveness.

It will be done by creating favourable business conditions, promoting cooperation between business, research and education, investment in research and development, ensuring technology transfer & intellectual property rights, launching business support services.

“Sunrise Valley” project’s objectives are: to provide modern conditions for quality education and research linked to professional activity and business environment, generate employment opportunities for highly qualified university graduates, scientists and other specialists, provide favourable conditions for commercialization of research, act as an indispensable link between currently active science and technology parks and business incubating system in Vilnius, provide basis for local and foreign investment for the research projects.

In the long run (till 2015) “Sunrise Valley” the largest unit of Lithuania’s knowledge cluster must be developed into the largest innovation centre in the Baltic States, where high added-value products and services will be created. “Sunrise Valley’s” long run vision: laser, information technologies and telecommunications businesses, business/science center unit for technology demonstration, intellectual property development center, high-tech laboratories for industry and science, business incubator and facilities for start-ups, recreation and commercial zones will expand, among other things including conference facilities, hotels, and the libraries.

Such a vision for “Sunrise Valley” was predicted by International Consortium “Centre for Strategy and Evaluation Services”, famous Technological parks from Great Britain, Sweden and experienced local business par-

tners. According to the evaluations by the year 2015 in territory of 2,5 ha about 150 new high-tech enterprises with more than 3000 employees will be created, among them: as mentioned above, Innovation Center for the development of laser and IT as well as the formation of business incubator and a scientific–technological park. It will be companies established by Universities and Research Centers, where students, professors and researchers from those institutions will work (Sunrise Valley).

## 7. Conclusions

The paper concludes that the needs for efficient cooperation between the systems of research, teaching, training, consultancy and practical production prove to exist in all spheres of modern society and its social economic life. Bridging science and business together is the important priority and a wave of the future in the process of the creation of knowledge-based economies:

1. The transition towards a knowledge economy requires that policy makers understand the comparative strengths and weaknesses of their countries and then act upon them to develop appropriate short and long-term policies and investments. It is essential for any country in developing structures for their knowledge based economies, to develop their own best practices based on their history and cultural development. Who better can develop its own strategy but the government of a particular country.
2. Lithuania will need to develop higher value-added market niches that will precisely call upon the Lithuanian capabilities to create an entrepreneurial economy that is integrated continentally and globally. Knowledge economy provides such opportunities especially in the context of knowledge and innovation in the European and global business.
3. Bridging science and business together provides a compelling platform to research the issues of upgrading competitive advantage in developed countries and contract out non-core competencies to emerging markets.

Conclusion was made, that the bridging science and business together via creating a network of knowledge institutions and projects based on innovative scheme such as Sunrise and Santara Valley in Vilnius, Santaka and Nemunas Valley in Kaunas and Klaipėda Maritime Valley, deliberately modeled after the Silicon Valley, California, create the starting position not only for Lithuania’s move to radical economic changes. Post-communist and other emerging market countries are well advised to jump to these new opportunities as they represent the best chance yet to realize the “latecomer’s advantage” by leapfrogging to technologies and models of doing business which are new for Western countries as well.

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