

# **The Changing Role of the Entrepreneurial University in Developing Countries: The Case of Latvia**

**Natalja Jarohnovich**

**Technology Transfer Centre of Kurzeme of Ventspils University College**

**Chem. Valdis Avotiņš**

**Engineering Research Institute “Ventspils International Radio Astronomy Centre”**

*The role of knowledge creators and accumulators like universities and their research institutions are consistently growing and obtaining new forms of operation. Recently the traditional university model considering importance of new knowledge flows in regional innovation systems tended to contribute to external knowledge absorption readiness thus requiring new roles for regional knowledge centres in less developed countries. In essence, today the model of interaction with the commercial sector has a much more complex mode. The primary aim of this paper is to systemize industry-university-society linkages, and emerging concepts of the entrepreneurial university in catching-up a country into the proper model scheme to catalyse a much easier and faster assessment of effectiveness factors for any university on its way to introducing top-down, or better bottom-up approaches of an entrepreneurial university. In the first part of this paper we analyse the concept of academic entrepreneurship and technology absorption readiness, the second part is devoted to entrepreneurial university models, and the third section analyzes the case of a small regional College and a national university in the capital city of Latvia.*

## **INTRODUCTION**

An entrepreneurial society refers to a place where knowledge-based entrepreneurship has emerged as a driving force for economic growth, employment creation and competitiveness in global markets (Audretsch 2007a&b).<sup>1</sup> In this context, the entrepreneurial university plays an important role as both a new knowledge-producer and a disseminating institution. In this sense, an entrepreneurial university could be defined as a driver of competitive environments with a common strategy oriented to being the best in all its activities (e.g., having good finances, selecting talented students and teachers, producing quality research) and tries to be more productive and creative in establishing links between education and research (Kirby 2005<sup>2</sup>)<sup>65</sup> below. Consequently, an entrepreneurial university is not only a promoter of multiple support measures for entrepreneurship but is also a developer of administrative techniques,

---

<sup>1</sup> Audretsch D.B. (2007a) The entrepreneurial society, New York, Oxford University Press. And Audretsch D.B., Grilo I., Thurik A.R. (2007b) Handbook of research on entrepreneurship policy. Edward Elgar Publishing, Massachusetts, USA, 241 p.

<sup>2</sup> Maribel Guerrero, David Urbano (2010) The Development of Entrepreneurial University, 29.

strategies or competitive conviction (Antoncic and Hisrich 2001)<sup>3</sup>. Based on this, entrepreneurial universities are involved in partnerships, networks and other relationships with public and private organizations that are an umbrella for interaction, collaboration, co-operation and among the core elements of a national innovation system<sup>4</sup> many different interactions may exist (Inzelt 2004)<sup>5</sup>. This means that the entrepreneurial university implements several strategies and new institutional configuration to work together with the government and industries to facilitate the generation and exploitation of knowledge and technology (Leydesdorff and Meyer 2006).<sup>6</sup> But still the missing component is “entrepreneurial thinking”. High growth and high impact innovation requires an entrepreneurial mindset that is able to assess big challenges as big opportunities. Peter Drucker<sup>7</sup> stresses that „entrepreneurs innovate” and deep involvement of e.g. academic entrepreneurs (entrepreneurs are not always business people) gets extremely high importance and entrepreneurial mindset is integrated into university community and in all its operational structures and parts.<sup>8</sup> In the literature, theoretical models have tried to visualise and explain the phenomenon of entrepreneurial universities (Clark 1998<sup>9</sup>; Sporn 2001; Etzkowitz 2004; Kirby 2005; O’Shea et al. 2005, 2008; Rothaermel et al. 2007<sup>10</sup>).

## RESEARCH

### Triple Helix Model & Regional Entrepreneurial Universities

Innovation is a driver of companies’ competitiveness leading to an increase of productivity and efficiency of production. The role of knowledge creators like universities is consistently growing and obtaining new forms of operation. Several authors outlined by Etzkowitz H., Leydesdorff L. (2001)<sup>11</sup> have stressed that since 1990s university-industry partnership was guided by interaction with government in a systematic way to promote economic and social benefits and outputs for society.

Triple-Helix theory<sup>12</sup> emphasizes the importance of commercial return from a university, introduces the entrepreneurial university model and distinguishes several routes of knowledge and technology transfer. BankBoston study informed that MIT graduates have funded 4000 companies with annual revenues for USD 232 billion worldwide.<sup>13</sup>

A more detailed approach considers the importance of knowledge flows in regional or national innovation systems (Etzkowitz (2001))<sup>14</sup> and EC (2001)<sup>15</sup>). In essence, the model of interaction has more complex mode. Sometimes the best way how universities may transfer their knowledge to industry and society is via soft or indirect channels, like publications, exhibitions, conferences, consultations, informal

<sup>3</sup> Maribel Guerrero

<sup>4</sup> We define NIS as a system where those who produce new knowledge are efficiently connected with those who apply this knowledge to produce demanded in market commercial products or services. Goldberg et al. (2006)

<sup>5</sup> Maribel Guerrero

<sup>6</sup> Leydesdorff L., Meyer M. Triple helix indicators of knowledge-based innovation systems. Introduction to the special issue. *Research Policy*, 35 (2006) 1441-1449.

<sup>7</sup> Drucker P. *Innovation and entrepreneurship. Practice and principles*. HarperBusiness, New York, 2006, p.26.

<sup>8</sup> Thorp H. And Goldstein B. *Engines of innovation. The entrepreneurial university in the Twenty-First century*. North Carolina Univ.Press., Chapel Hill, 2010, 170 p.

<sup>9</sup> Clark 1998

<sup>10</sup> Maribel Guerrero, David Urbano (2010) *The Development of Entrepreneurial University*

<sup>11</sup> Etzkowitz H., Leydesdorff L. (2001) *Universities and the global knowledge economy*. Continuum, London, 2001, p.13.

<sup>12</sup> Etzkowitz H., Leydesdorff L. (2000) *The Dynamics of Innovation: From National Systems and „Mode 2” to a Triple Helix of University-Industry-Government Relations*, *Research Policy* 29 (2): 109-123.

<sup>13</sup> BankBoston 1997, MIT: *The impact of innovation*. Bank Boston Economics Department Special Report, Boston MA, USA.

<sup>14</sup> Etzkowitz H., Leydesdorff L. (2001) *Universities and the global knowledge economy*. Continuum, London, 2001, p.13.

<sup>15</sup> EC. (2001) *Building an innovative economy in Europe, a Review of 12 studies of innovation policy and practice in Today’s Europe*. 5, 11.

exchange or unpaid advices.<sup>16</sup> Non-linear approaches to innovation processes requires a wider focus to understand clear role of both industry and university.<sup>17</sup> Kautonen (2000)<sup>18</sup> presents several categories of knowledge based companies involved: customers, suppliers, competitors and partners.

As a result of substantial private and public investment in research activities it is important to manage existing interactions in a way to get maximised return back.<sup>19</sup> Sources of new knowledge might be classified as follows:

- research organisations (we can name them as “R&DO”);
- customers (C);
- other research driven firms (B);
- intermediates (here we classify also educational and training institutions, it could be better to name it as external expertise class;
- individual persons (P).

The variety of existing technology transfer channels are the main routes for commercial return - B2R&DO, B2B, B2C, B2P, R&DO2R&DO we described in our previous work, where we identified main technology transfer (TT) channels between R&DO and industry. There is growing importance of intangible components of technology transfer process: role of formal and informal linkages as well as skills and abilities to transfer, imitate, copy, adopt and absorb are increasing.<sup>20</sup>

Dalkir (2005)<sup>21</sup> proposes three main steps in knowledge transfer and management model:

1. knowledge assessment, sharing and dissemination;
2. knowledge understanding, acquisition and application;
3. knowledge capture and / or creation including adjustment or update of captured one.

The primary aim of this paper is to understand better processes of industry-university linkages and emerging concept of entrepreneurial university, and systemizing them into proper model scheme to allow much easier and faster assess factors of effectiveness of any university on its way to introduce elements of entrepreneurial university. In the first part of this paper we will analyse the concept of academic entrepreneurship, the second part is devoted to subject models, but third section analyses case of Latvia.

Delivering the “third mission” is now at the top of almost all university agendas. The term “entrepreneurial university” (Etzkowitz, 1983)<sup>22</sup> has been adopted by academics and policy makers to describe outstanding universities that effectively deliver on their “third mission” (Clark, 1998,<sup>23</sup> Van Vught, 1999, Lambert, 2003). A growing body of literature relating to entrepreneurial universities and academic entrepreneurship equates these developments to the commercialisation of science. However, a increasing signal has been emerging from the literature about a simple causal relationship between university-led scientific innovation and economic benefits (Fairweather, 1990, Liu and Dubinsky,

---

<sup>16</sup> Philpott K., Dooley L., O'Reilly C., Lupton G. The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31, 2011, 161-170.

<sup>17</sup> Etzkowitz H., Leydesdorff L. (2001)

<sup>18</sup> Kautonen M., Tiainen M. (2000) *Trajectories, Innovation Networks and Location. A Comparative Study of Two Regions in Finland*. DRUID Winter Conference on Industrial Dynamics, Copenhagen, Denmark.

<sup>19</sup> Barnes T., Pashby I., Gibbons A. Effective university-industry interaction: a multi-case evaluation of collaborative R&D projects. *European Management Journal*, 2002, vol.20, No.3, pp.272-285.

<sup>20</sup> Jarohnovich N., Avotiņš V. Assessment of technology transfer and diffusion models in Latvia. *J. of Business Management*, 2009, No.2, pp.31-41.

<sup>21</sup> Dalkir K. (2005) *Knowledge management in theory and practice*. Elsevier Butterworth-Heinemann publications.

<sup>22</sup> Etzkowitz, H. (1983) *Entrepreneurial Scientists and Entrepreneurial Universities in American Academic Science*. Dordrecht, Holland: Minerva.

<sup>23</sup> Burton Clark, 1998, *Creating entrepreneurial universities: Organizational pathways of transformation*, p4. Pergamon Press

2000<sup>24</sup>). Bramwell and Wolfe (2005)<sup>25</sup> concluded that universities can have a much wider impact on regional economic development than simply the provision of basic research but, to be fully effective, the knowledge assets of the university must be fully aligned with the multi-variate needs of local firms. This study describes a range of enterprising activity within a new type university that supports this more inclusive view of the university role in economic development.

In many regions, universities are viewed as the core of the knowledge base, acting as key elements of innovation systems, supporting science and innovation-based regional growth (Huggins & Kitagawa 2008)<sup>26</sup>. The so-called regional engagement of universities has been developed through an evolutionary process during the last 50 years. Traditionally, universities primarily focus on teaching and, to some extent, research, while university output were elite education. Universities have had to seek alternative sources of funding from business, industry, civil society and non-national state actors. Also, the public funding became increasingly competitive funding, and research activities often require public-private partnership. This is called the “entrepreneurial turn”, or the servicing mission of universities (Tjedvoll, 1997; Inman & Schuetze, 2010)<sup>27</sup> or entrepreneurial university (Gibbons et al., 1994<sup>28</sup>; Clark, 1998; Chatterton & Goddard, 2000). Later, in addition to teaching and research universities started to adapt a third role (third mission) in regional economic development, which can be described as “community service”, “regional engagement” (Holland, 2001)<sup>29</sup>, “regional innovation organisation” or “academic entrepreneurialism” (OECD, 1999).<sup>30</sup>

But it is not sufficient to have all three components on university agenda: still the missing component is top-down driven “entrepreneurial behaviour”. Consequently, new entrepreneurial strategy should motivate entrepreneurial academics working in quasi firms or entrepreneurial laboratories in close collaboration with industry forming entrepreneurial mindset of university community in all its operational structures and parts.<sup>31</sup>

## **Way of Transformation to Entrepreneurial University**

### ***A. Promotion of Entrepreneurship Training in Different Forms***

Transforming to an Entrepreneurial university requires a university whose graduates have received necessary entrepreneurship skills within study courses during their education, with the university offering practical exercises and case analysis in short term courses and workshops by sector professionals. Integration of schools of entrepreneurship in a study process help to diversify courses by adding entrepreneurial modules. The dimensions of entrepreneurship have obtained various forms that some universities include entrepreneurial modules in the framework of a multi-unit lesson, and some offer training as a separate field of study. In such a course, students learn basic concepts, the importance and the role of entrepreneurship in establishing small and average companies, get market and economic development understanding, and learn how to get commercial return from investment into R&D.

---

<sup>24</sup> Malone, T. W., Laubacher, R. J., & Johns, T. (2011, July). The Big Idea: The Age of Hyperspecialization. *Harvard Business Review*.

<sup>25</sup> Maribel Guerrero, David Urbano (2010) The Development of Entrepreneurial University,

<sup>26</sup> Robert Huggins, Andrew Johnston, Rebecca Steffenson, Universities, knowledge networks and Regional policy (May, 2008)

<sup>27</sup> Benneworth, P., Charles, D. & Madanipour, A. (2010). Building Localized Interactions Between Universities and Cities Through University Spatial Development. *European Planning Studies*, 18:10, pp. 1611 – 1629.

<sup>28</sup> Gibbons M. The New Production of Knowledge. for an in-depth exploration of the significance of networks in knowledge creation.

<sup>29</sup> Huggins, R. & Johnston, A. (2009). The economic and innovation contribution of universities: a regional perspective. *Environment and Planning C: Government and Policy* 2009, volume 27, pp. 1088 - 1106

<sup>30</sup> Organisation for Economic Co-operation and Development (1999) The Response of Higher Education Institutions to Regional Needs. Paris: OECD/Institutional Management in Higher Education programme.

<sup>31</sup> Thorp H. And Goldstein B. Engines of innovation. The entrepreneurial university in the Twenty-First century. North Carolina Univ.Press., Chapel Hill, 2010, 170 p.

### *B. Creating Entrepreneurship Opportunities in Universities*

Universities now more and more provide an ecosystem that individuals or groups of nascent entrepreneurs can practice applying it. These environments are often called growth centers, design centres, business laboratories, pre-incubators and incubators, business idea contests, student entrepreneurship centres, innovative garages, business accelerators, which can operate inside universities or outside. In growth centres entrepreneur individuals or groups can obtain practical skills how entrepreneurs operate and be able to operate in turbulent markets themselves. Nascent entrepreneurs are supported in different ways by soft or hard innovation infrastructure, such as environment or facilities, or even workshop and laboratories. They are also offered legal, scientific and technical advice or consultations by experienced business people and industrial academics. They are taught marketing and financial affairs, developing "Business Plan", running on-job learning activities, and are supported financially until they generate sufficient deal flow.

### *C. Administrative Processes of Educational Environment for Growing Entrepreneurs*

Universities, by establishing investigation and development centres, have realised their initial task and have transformed from being mere practical entrepreneurial skills oriented university to entrepreneurial and investigation focused university.

## **Models of Entrepreneurial University**

### *Concept*

Burton Clark (1998)<sup>32</sup> defines an entrepreneurial university as “a type of modern university that stands on its own feet in order to adapt, on its own terms, to a highly complex and highly uncertain world”. Clark (2001)<sup>33</sup> emphasizes common culture characteristic to entrepreneurial universities supporting commercialisation activities. Henry Etzkowitz (2004)<sup>34</sup> foresees entrepreneurial future of universities and suggests hybrid organisational forms as most suitable to balance interaction with industry and public organisations with increasing independence of university. Preconditions of a successful university with the ability to transform towards entrepreneurship is strong and will tend to attract talented foreign students and provide competitive educational and research services; substantial financial assets, primarily in the form of land and buildings, to make own investments and sustain independence; growing income from tuition fees stabilises university budget; university can attract industry funding for research projects employing PhD students and in this respect are comparable to world leading universities received direct funding from state.<sup>35</sup>

Independence should be also be delegated downward to departments, and to a certain extent to even the laboratory level. Instead of education sold to students by university or state lifelong learning academic partnership among teachers and qualified majority of students should be introduced where building of entrepreneurial spirit is merged with real research in institutes. Establishment of strong academic community with entrepreneurial mindset should integrate willingness of alumni to contribute to their Alma Mater. This is a relatively undeveloped use of university development potential in Europe and even more in Latvia.<sup>36</sup>

The transformation of a university's philosophy starts with the change of university-stakeholders relations and happens when a majority of influential people agree to implement organised initiative how to change university within a medium term.<sup>37</sup>

---

<sup>32</sup> Clark B. (1998) Creating entrepreneurial universities: organisational pathways of transformation. Oxford: Pergamon-Elsevier Science.

<sup>33</sup> Clark B. (2001) The entrepreneurial university: new foundations for collegiality, autonomy, and achievement. Journal of the Programme on Institutional Management in Higher Education, 13 (2), 2001, 17-23.

<sup>34</sup> Etzkowitz H. (2004) The evolution of the entrepreneurial university. International Journal of Technology and Globalisation, vol. 1, No.1.

<sup>35</sup> The KTH Entrepreneurial faculty Project. VINNOVA Report VR 2005:13, Stockholm, 2005, 128 p.

<sup>36</sup> Ibid, p.24.

<sup>37</sup> Clark B. (1998)

### *Creation of Environment and Entrepreneurial Mindset in the Academic Community*

Creation of an environment for (active support of) knowledge exploitation should happen both inside and outside the university. Inside it's university policy regards to its intellectual property, general strategy, spin-off and start-up companies, and sets motivation and conditions for university – industry interactions. It also includes the uptake of entrepreneurial modules in the regular curriculum of university students (as minor program or part of major programs). External environment includes incubator, science park, clusters, even venture fund. All university community should have as objective entrepreneurial behaviour and the improvement and the optimisation of instruments to better exploit university knowledge and technology. A relatively recent concept of pre-incubation<sup>38</sup> was introduced.

Concept of pre-incubation is comparable to the Spanish (University of Barcelona) concept of “quasi companies”, but different from quasi companies: the incubatees don't stay in the university, but are brought further under the organisational umbrella of the incubator.<sup>39</sup> When entrepreneurial behaviour in the academic community (undergraduate, graduate and PhD students, teachers, researchers, professional and administrative staff) is to be stimulated, than special training programmes for each of these groups have to be developed and implemented.

Teaching and researching personnel at least should have a practical working knowledge of entrepreneurship and a clear understanding of what changes are and what are not possible at their university: in case they are inclined towards setting up a company themselves, there should also be training and available facilities (to test the technological and market feasibility, and for the office of the company) for them – preferably at the university campus. The administrative staff must also be able and willing to support and facilitate the entrepreneurial and innovation culture in the academic community.

Technology managers serve as intermediate link between two separate “worlds” – academics and entrepreneurs. We should keep in mind also traditional resistance of academics to firms and entrepreneurial managers and need to provide enough trust and appropriate culture to make collaboration motivated and encouraged.<sup>40</sup>

Many of European academics take the term “entrepreneurial university” as simply research commercialisation and reduction of academic freedom in education and research.<sup>41</sup> The solution might be informative, motivation and explanatory seminars about entrepreneurial university for academic community. The bottom-up policy approach to start transformations towards entrepreneurial university might be more sustainable compared to more used in the EU centralised or top down<sup>42</sup> approach.<sup>43</sup>

Several studies covered by Perkman (2011) show that quality of research in departments of university correlates to engagement with industry.<sup>44</sup>

Incentive policy for academics to engage in entrepreneurship is extremely important and usually is known as “university intellectual property policy” setting spread of any commercial income from owned by university intellectual property among researcher, department and university.

---

<sup>38</sup> Reiner R., Sievers U. Pre-incubation: new concepts to support start-up activities of universities and research institutes. PP.97-108. Broadfoot Ch., Sheen M. Towards best practice in (pre-)incubation. PP.77-84. and Steffens J., Traude A. The Bielefeld concept of pre-incubation. In: New concepts for academic entrepreneurship. Proceedings of the USE-it! Conference, Editors Van der Sijde P., Wirsing B., Ridder A. 2002, Twente University Press, Enschede, The Netherlands, 179 p.

<sup>39</sup> Etzkowitz H. Research groups as „quasi-firms”: the invention of the entrepreneurial university. *Research Policy* 32 (2003) 109-121.

<sup>40</sup> Siegel D.S., Waldman D.A., Atwater L.E., Link A.N. Commercial knowledge transfers from universities to firms: improving the effectiveness of university-industry collaboration. *Journal of High Technology Management Research* 14 (2003) 111-133.

<sup>41</sup> Philpott K., Dooley L., O'Reilly C., Lupton G. The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31, 2011, 161-170.

<sup>42</sup> Jacob (2003)

<sup>43</sup> Ibid.

<sup>44</sup> Perkman M., King Z., Pavelin S. Engaging excellence? Effects of faculty quality on university engagement with industry. *Research Policy*, 40 (2011) 539-552.

### *Open Innovation and University Technology Transfer*

The tacit and tangible knowledge created and available in a university forms framework of the university's innovation system and is used in technology transfer processes. Several main processes determine delivering of problem-solving consultancies for new innovative products and services:<sup>45</sup>

1. Outside-in process, where external knowledge is sourced from universities, customers, suppliers and partners to initiate innovation inside firm.
2. Inside-out process, where university or its start-up transfers ideas to outside environment getting income from Intellectual property rights portfolio.
3. In-campus process, where collaborative research activities within university innovation system generate new innovations.
4. Collective or hybrid process, where academics and industry are jointly involved in collective research.

The core assumption here is that firms increasingly innovate by using external source of knowledge, and universities have increasing role as overall external knowledge providers.<sup>46</sup>

The balance between open science tension more to publish and academic innovation motivation system related to IP protection and disclosure could be managed.<sup>47</sup> Open science would provide access to university tacit and tangible knowledge at far earlier stage excluding cases of licensing of university IP by patents. The industrial or applied research much closer to market needs is more guided towards commercial return.<sup>48</sup>

### **Commercial Return of University Research**

The intellectual property (generated new knowledge, inventions, proof of concept) can be protected by a patent, and a patent owned can be commercialised either via giving a licence to or selling the patent to a third party. This is traditional route, although many universities rarely use this route. The other routes for knowledge transfer, used by universities, are (see also Figure 1):

- provision of highly skilled and talented graduates equipped with problem-solving skills to both private and non-commercial organisations represent the most valuable channel to society. Much limited but important transfer of knowledge happen through movement of research personnel to industry, sometimes it covers also technical and support stuff transfer. Availability of skilled workforce capable to meet future industry needs ensures industry for collaboration.
- exploitation of embedded knowledge: there is a lot of knowledge embedded in the university equipment and facilities: these university facilities are (most of the time) rather state-of-the-art and could be put at the disposal of companies (facility sharing). Sponsored research and equipment by companies reflect philanthropic side of partnership.
- contract research: contract research shouldn't only bring in money, but also (new) knowledge (incl. methods and technology).
- research with collaborative nature: Joint R&D ventures with industry or clusters of technological firms: one of the core tasks of a university is doing research and the built-up expertise could be used to team up with industry (one company or a group of companies) to focus on more industrial oriented research leading to the development of new products; such a joint venture will be a new legal entity in which the university receives equity e.g. return for invested knowledge (expertise and patents / licences) and the use of university facilities (equipment, building). R&D consortia,

---

<sup>45</sup> Enkel E., Gassmann O., Chesbrough H. (2009) Open R&D and open innovation: exploring the phenomenon. *Journal of R&D Management* 39 (4), 2009, pp.311-316. Blackwell.

<sup>46</sup> Thursby J., Thursby M. (2007) University licensing. *Oxford Review of Economic Policy*, vol. 23, No.4, 2007, pp.620-639, Oxford University Press.

<sup>47</sup> Coleman M., Cormican K. An exploration of open innovation in university technology transfer.

<sup>48</sup> Ibid

Competence centres also play here an important role as well as industry professional associations etc. Science parks can be characterised by long term relationships between universities and industry and might obtain very complex and integrated, even including non-market channels of technology transfer formats. “On campus” presence provides additional benefits to new firms as result of technology diffusion and spillovers. Most significant of them is uncompensated “learning to analyse”, “in which a rival firm learns the technological or design secrets of another firm’s” (might represent also R&D consortia or organisation) formula, or products”.<sup>49</sup>

- Licensing where firm purchases exploitation or exclusive use rights of new technological solution or know-how.
- consultancy: knowledge and technology can be transferred via hired by industry university researchers and engineers providing technological solutions, problem solving consultancies and advices to industry. It often happens that consultancy contract is the first relation with firm, and if it is satisfactory then the more complex longer term collaborative contracts might be introduced.
- continuous professional development – via this route the knowledge and the technological developments are transferred to industry within training programmes, e-learning tools, seminars and workshops.
- Start-up companies. OECD (2001)<sup>50</sup> identified five types of university start-ups:
  - o A spin-off company started by staff, professors and post-docs working in an university and using university born new knowledge (otherwise its start-up);
  - o A new spin-off based on a licence (or a patent) for technology originating from the university;
  - o New companies started by students or alumni and using obtained in campus new ideas;
  - o New firms that are located in an academic incubator or science park;<sup>51</sup>
  - o New companies in which the university has equity or which are directly founded by the university.
- Open source technology transfer, absorption and diffusion.

Some authors (Philpott (2010),<sup>52</sup> Powers (2004)<sup>53</sup>) also stress potential of university to obtain large-scale open competition research grants from external sources for basic research as one of the form of entrepreneurial activities. As side measures supporting academic entrepreneurship can be mentioned publishing of books and articles thus enhancing university reputation and attracting industry to the campus.

The new firms started by graduates or alumni can rather be considered as start-ups and we can assess them as spin-off of the university when the university (knowledge and technology) substantially contributes to the company (at least in the start-up period). The same could be said also about professors and post-docs’ established firms.

The relevance of incoming flow of technological information to university is higher for less developed country and it may have the following channels:

- Import of relevant to research structure goods and services. All such import bear potential for absorption of technological information to be analysed for design purposes and reverse engineering.
- Foreign direct investment – through technology advanced subsidiaries and formal and informal channels;

<sup>49</sup> Maskus K. Encouraging international technology transfer. Project on IPRs and sustainable development, Issue Paper No.7. ICTSD and UNCTAD, France, 2004, Cyclus Print, 50 p.

<sup>50</sup> The OECD publication uses „public sector” rather than university

<sup>51</sup> This type of companies is not considered as a university spin off, it is mentioned because of OECD publication.

<sup>52</sup> Philpott K., Dooley L., O’Reilly C., Lupton G. The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31, 2011, 161-170.

<sup>53</sup> Powers J. R&D funding sources and university technology transfer: what is stimulating universities to be more entrepreneurial. *Research in Higher Education*, 45 (1).



- Collaborative networks: JV, competence centres, clusters, industry associations, technology platforms, project consortia and collaborative or partnership research.
- Recruitment of former in industry employed senior technological staff and attraction of visiting professors.
- Diffusion of information through open source science, technology exhibitions etc.

### Triple Helix Model

The initial linear model of the innovation was transformed by Etzkowitz and Leydesdorff to a Triple Helix model with a spiral approach of innovation capturing multiple reciprocal interactions among organisational structures (public, private and academic) “at different stages in the capitalisation of knowledge”.<sup>54</sup> Triple Helix model is part of regional innovation system as the universities play central role as knowledge – producers and disseminators. Nevertheless of the elaborated triple-helix based policies quite little changes in behaviour of government were achieved, the triple-helix approach was applied more in static way, like “a hollistic measure”, not a basis for actual and needed policy formulations.<sup>55</sup> According to the triple-helix theory in an emerging knowledge economy those places with entrepreneurial universities should increasingly demonstrate growing demand for knowledge transfer to industry and society. In reality we see deviations from this rule, i.e. asymmetric R&D spread.<sup>56</sup> The third role of universities – to cooperate with surrounding ecosystem in addition to teaching and performing world class research still stay on top of academic-industry relations thus narrowing earlier projected in triple helix approach of wider private – public interaction.<sup>57</sup> The solution might be extension of this third role to creativity and cross-disciplinary conducive environment for talented people. This requires also for new revised actions within more dynamic and closer, long-term university- industry collaboration on a bases of entrepreneurial mindset.

The US policy document “Innovateamerica”<sup>58</sup> already before eight years stated that “universities should promote an innovation-oriented culture while maintaining a commitment to creating new knowledge at the frontiers of research. This culture should seed traditional technical studies with new exposure to methods for creative thinking and translating ideas into commercial applications.”<sup>59</sup> New approach includes changes in curricula, establishment of innovative partnerships and creation of efficient innovation support infrastructure.

It is not enough to attract the right firms and establish active collaborative academic-industry networks. The talented and skilled people should be attracted by business growth additional policies which means a strong focus of people’s social environment in addition to the business climate. The attitudes of politicians and planners should be redirected from firms to talents (in reality in three areas with different focuses: how to keep existing, how to return back gone and how to attract externally educated talents), i.e. away from transport hubs and urban areas to creative city-regions with high density and diversity of human capital, knowledge and creativity thus spurring economic growth. This strongly introduces the concept of so-called local innovation ecosystems with new tasks also for universities.<sup>60</sup>

<sup>54</sup> Etzkowitz L., Leydesdorff H. (1995) The triple helix: university-industry- government relations a laboratory for knowledge based economic development. EASST Review, vol.14 (1), March 1995. <http://www.easst.net/review/march1995/leydesdorff.shtml>

<sup>55</sup> Etzkowitz H., Leydesdorff L. (2000) The dynamics of innovation: from national systems and „mode 2” to a triple helix of university-industry-government relations. Research Policy, 29, 109-123.

<sup>56</sup> Cooke P. 2005 Regionally asymmetric knowledge capabilities and open innovation: exploring „globalisation 2” – a new model of industry organisation. Research Policy, 34 (8), 1128-1149.

<sup>57</sup> EU (2006) Constructing regional advantage. Principles-perspectives-policies. EU, DG Research, 2006, 98 p.

<sup>58</sup> Innovateamerica. National Innovation Initiative report „Thriving in a world of challenge and change”, Council of Competitiveness, USA, 2004, 68 p.

<sup>59</sup> Innovateamerica. National Innovation Initiative report „Thriving in a world of challenge and change”, Council of Competitiveness, USA, 2004, 68 p.

<sup>60</sup> Florida R. (2007) The flight of the creative class. The new global competition for talent. New York, HarperCollins Publishers, 326 p..

## Findings

The entrepreneurial university in its simplest model interlinks its three missions: education, research and societal benefits (see fig.1). Institutionally that has meant having in a university structure besides traditional education and research functions, a technology transfer office (TTO) and active patenting of own research results by the university (Baldini, 2006).<sup>61</sup>

The general business model schema includes main fields and players of cooperation: education and research, government, industry, but it does not present in details all possible trajectories of knowledge creation and functions of entrepreneurship domain in the university environment. There can be two different approaches to university business model:

- wider view to university as a creator of intellectual and social capital for and in society,
- narrower view to university as economic value producer from created in campus knowledge as revenues-rising function.

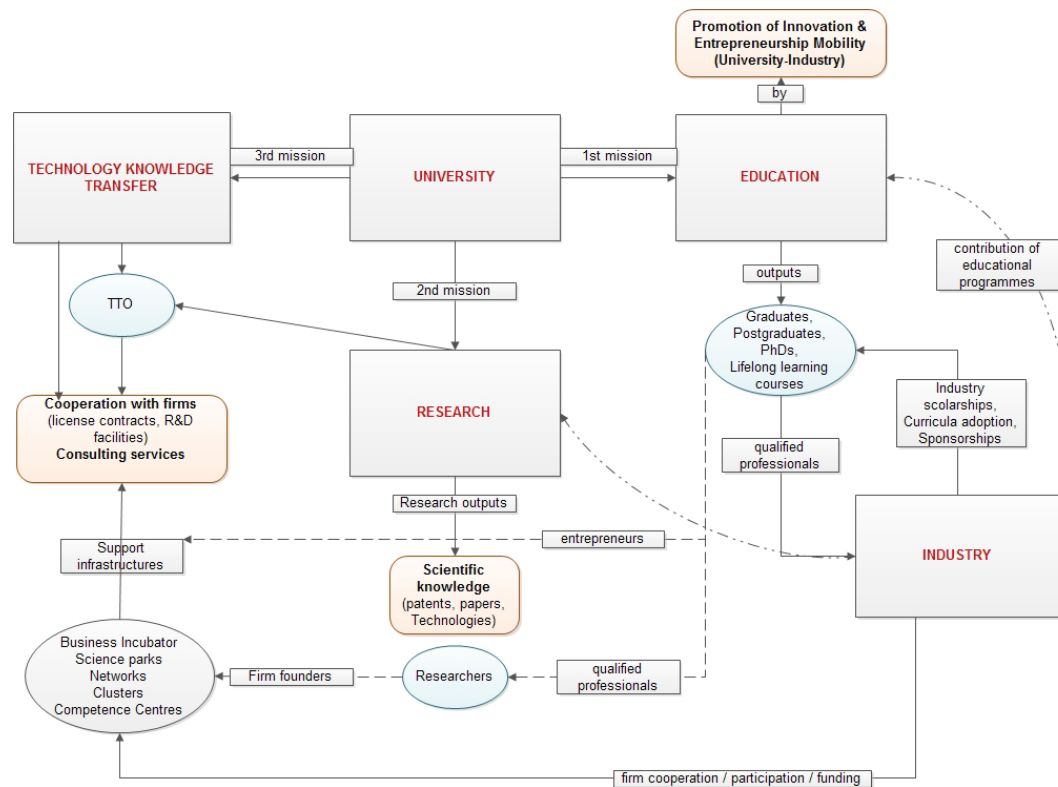
Although, other alternatives could be located somewhere between them, which model to prefer depends on the agreement between society and the university. Not depending on institutional realization, knowledge transfer and entrepreneurship domain in current business model have the following roles (Howard, 2005; Autio, 2007; Mets, 2009):

- Knowledge diffusion is covered mainly by its communication to scientific and popular publications, and standards, capacity building of university graduates – new employees for private and public sector carrying new knowledge to their jobs, including life-long (post-graduate) training, but partly also via other staff public and personal communications, and (not protected as IP) new products and services launched by university spin-offs. That means also creation of social capital and sharing of knowledge via networks. The role of entrepreneurship domain is mainly educational: training university students and facilitating entrepreneurial culture within the wider, nowadays more virtual region.
- Knowledge creation means creation of new intellectual property and its protection at first, with following limited publications, sales of licenses on patents and other protected IP to industrial partners, including investment of own IP into spin-off companies. Entrepreneurship domain (support system) is mainly targeted to spin-off processes and entrepreneurial mindset and skills of the academic personnel, incl. development of entrepreneurial environment, business acceleration, coaching and mentoring by earlier entrepreneurs, seed and venture capital funding, etc.
- Knowledge transfer partnerships includes donation and corporate sponsoring of research projects and funding scholarships, contracted teaching services, research and consultancy, cooperative and collaborative research, business and research partnerships, incl. industry research centres and institutes, joint or semi-industrial research laboratories, facilities and ventures. Because of complexity of ownership IP becomes special issue in this collaboration model. The roles of entrepreneurship in aforementioned activities are strategic, focused to management support functions to industry by linking business and IP strategies.
- Knowledge engagement arises from the third mission of university and reflects Triple Helix interaction to solve challenging problems for society. Such need is stated by state policy side and need for active collaboration of Triple-Helix partners in the field of strategic issues of knowledge-based economic development, including R&D and knowledge transfer (absorption) policies and support measures on the state level.

---

<sup>61</sup> Baldini N., Grimaldi R., Sobrero R. (2006) Institutional changes and the commercialisation of academic knowledge: a study of Italian universities' patenting activities between 1965 and 2002. *Research Policy* 35, 518-532.

**FIGURE 1**  
**THE MODEL OF UNIVERSITY WITH THREE STRATEGIC PRIORITIES**



Hindle (2004) tried to integrate commercialisation, entrepreneurship and spin-offs from public research.<sup>62</sup> The use of the life-cycle of new business ideas as a base of model leads to linearity of process which in turn limits applicability of such a model.

Jacobs (2003)<sup>63</sup> analysing the case of Chalmers Technological university and suggests the need to establish an integrated structure for supporting science based entrepreneurship. Getting substantial funds for research Swedish universities have achieved impressive research results. Lack of upside incentive scheme for academics combined with existing downside risks for inventors' careers has lead policy for commercialisation of research results efforts to a failure.<sup>64</sup>

The existing reward schemes for academics are not fully encouraged as researcher's career cited publications determine the researcher's reputation and recognition. According to Goldfarb (2003)<sup>65</sup> three possible measures to compensate inventors are salary, royalties and equity. Jensen (2001)<sup>66</sup> proves that

<sup>62</sup> Hindle K., Yencken J. Public research commercialisation, entrepreneurship and new technology based firms: an integrated model. *Technovation* 24 (2004) 793-803.

<sup>63</sup> Jacob M., Lundqvist M., Hellsmark H. Entrepreneurial transformations in the Swedish university system: the case of Chalmers University of Technology. *Research Policy* 32 (2003) 1555-1568.

<sup>64</sup> Goldfarb B., Henrekson M. Bottom-up versus top-down policies towards the commercialisation of university intellectual property. *Research Policy* 32 (2003) 639-658.

<sup>65</sup> Goldfarb (2003) - Ibid

<sup>66</sup> Jensen R., Thursby M. (2001) Proofs and prototypes for sale: the tale of university licensing. *American Economic Review* 91, 240-259.

most preferred by academics are research grants allowing the researcher to keep place in the lab and continue commercially viable and more prestige research. It is important for researcher to avoid downside risk of lost academic opportunity which occurs if commercial activity requires time and resources for the new venture instead of initially planned for research activity.<sup>67</sup> In the case of grant researcher may work for company as a consultant or founder, but salary usually is insufficient incentive, especially in a case of tacit knowledge transfer. The alternative might be additional to salary in academic organisation consultancy fees; the major risk is related with potential conflict of interest. The third option for academics is to establish new firm in a way not to leave their academic position. In IPR regulated environment performance-based compensation mechanisms like royalties or equity prevail over hourly-limited or ceiling based salary schemes. If IPR protection is weak and share of tacit knowledge high, like for electronics industry, rational for transfer motivation is to use equity incentive.<sup>68</sup> Transfer of IPR to university instead of researcher in USA (Bayh-Dole Act) has created encouraging incentives for inventors, including also universities, departments etc. Temporary leave for academics to set up a company which is traditionally used in USA, is less convenient in Europe; it has often been an interest of faculty to break-up the researcher – industry contacts as researchers' payment system equal to civil servants conflicts with valuated compensations offered by industry – as a result it is difficult to retain such competent scientists or engineers. The consequence if universities have little involvement in technology transfer is that academics with their professor privilege (like in Sweden) tend to get consultancy fee as compensation.<sup>69</sup> Faculties usually are not part of reward procedure. Swedish (in general – European) attempts to introduce in universities USA based entrepreneurship models lead to top-down model compared to bottom-up approach in USA. In terms of publications in recognised journals per million USD of university budget Sweden is second to Israel while USA ranks less than 20<sup>th</sup>. Goldfarb (2003) emphasises that USA universities characterise higher capability, competition in all levels and flexibility to adapt to external changes. The bulk of undergraduate teaching in Sweden is done by teachers who do not perform research at all and are paid as civil servants.<sup>70</sup> The conclusions of comprehensive analysis of Swedish academic entrepreneurship system performed by Goldfarb (2003) can be easily applied also to wider European regions. Etzkowitz (2003)<sup>71</sup> emphasizes that top-down creation of entrepreneurial university model in centralised Europe's university system is a response to growing innovation gap between USA and Europe. Research groups of 8-9 people lead by professor in USA operates with certain freedom as small business entities where professor takes similar to entrepreneurial leadership of research group, keeps relations with external financiers, spends more time for organisational work compared to research.<sup>72</sup>

Wood (2011)<sup>73</sup> introduces a process model approach to explain academic entrepreneurship as a series of separate events. The weakness here is that we replace earlier fundamental research system with fragmented and not interacting technology commercialisation actions.

As a result of the analysis we can assume that upside is a driven Entrepreneurial University is the new generation model of university development in USA to react to global competition for talents. Europe is trying to seed in centrally this model in universities with three component strategies which rarely yet is demonstrating good performance. The key question in Latvia is whether university with a clear education priority in strategy and research set as only a sub-priority can think for and move directly to the model of

<sup>67</sup> Goldfarb (2003)

<sup>68</sup> Cohen W., Nelson R., Walsch J. (2000) Protecting their intellectual assets: appropriability conditions and why US manufacturing firms patent (or not). NBER Working Paper, No.7552.

<sup>69</sup> Goldfarb (2003)

<sup>70</sup> Etzkowitz H., Asplund P., Nordman N. The university and regional renewal: emergence of an entrepreneurial paradigm in the US and Sweden. In: Tornquist G., Sorlin S. (Eds.) The wealth of knowledge. Universities in the new economy (2000)

<sup>71</sup> Etzkowitz H. Research groups as „quasi-firms”: the invention of the entrepreneurial university. Research Policy 32 (2003) 109-121.

<sup>72</sup> Ibid.

<sup>73</sup> Wood M.S. A process model of academic entrepreneurship. Business Horizons (2011) 54, 153-161.

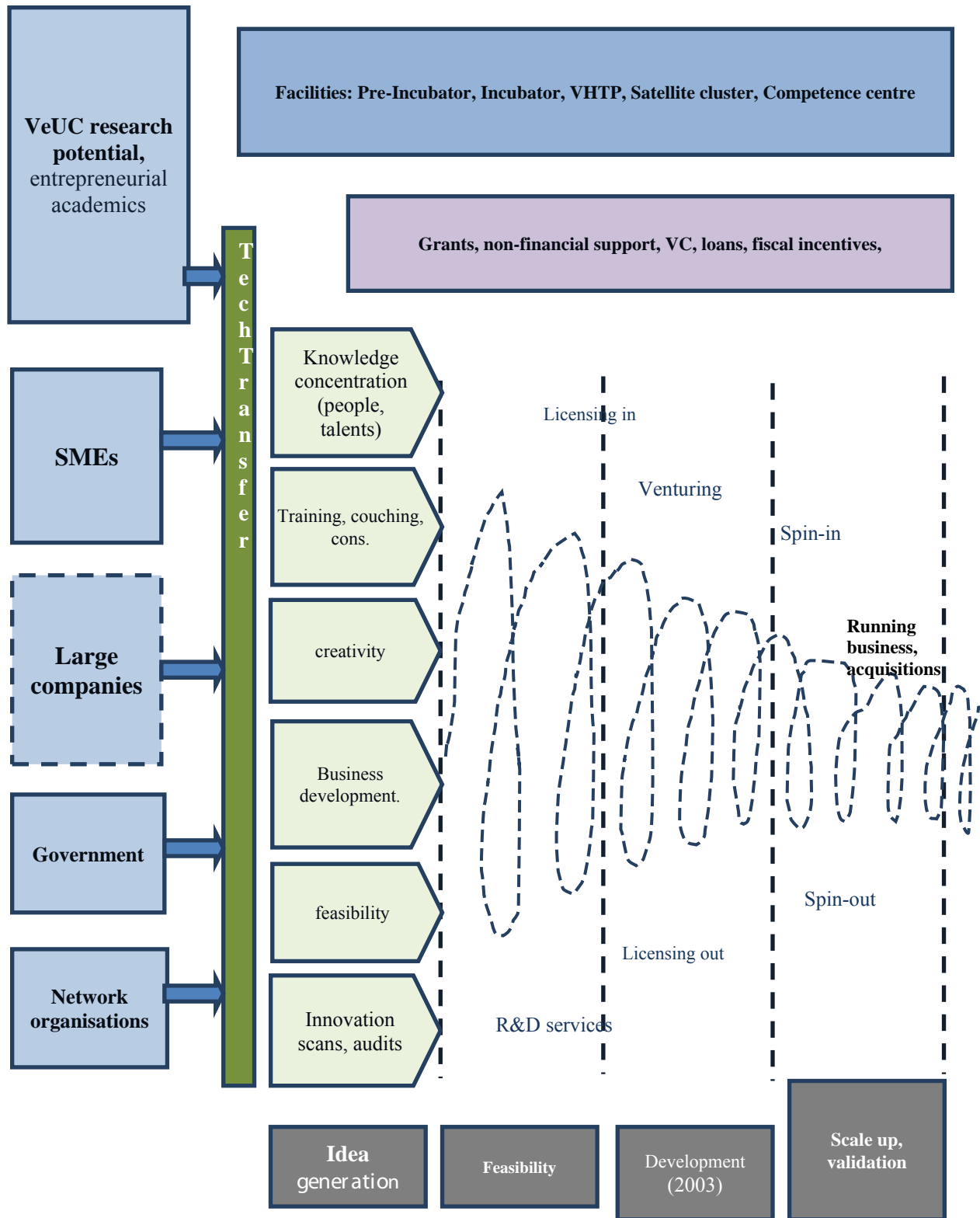
entrepreneurial university? Almost all large public universities in Latvia have structure of departments where research institutes with few exceptions are sub-structures of departments with a highest priority to provide qualitative education services up to PhD level studies. Research activities are mainly integrated within PhD studies with aim to renew university's professorship and to keep education – research linkages as getting feedback for teaching process. Institutes usually consist of 3-4 smaller divisions or labs heavily involved in teaching. Policy is determined mainly by the Dean and Department Council with strong educational priority dominance over research activities. All senior personnel are twofold elected – as academic teachers and researchers and counted in two parallel personnel registers. Sometimes it is really difficult to distinguish what part of time professor is spending for research as a professor and what as a senior elected researcher and how to avoid conflict of interests in projects. Such mismatch is catalysed by state system of financing (low state expenditure for R&D) and separate laws for Higher Education and Research more reflecting strive to survive for researchers instead of smart government policies.

The large emigration outflow of young talents and graduates abroad and low birth rates with followed essential decrease in number of students, aging professorship with limited rotation caused by required ability to provide lectures in Latvian, determines need for strategic changes in local university policies and administrative mindset. Estonian and Lithuanian universities not speaking about other more developed Baltic Sea Region countries show much higher flexibility and will, they operate with larger resources and outperform Latvian ones. The comparatively young regional university colleges (established in average before 15-18 years, as well as private Higher Education Institutions) have a role of catalysts of regional growth and might be more adaptive to new situation compared to less flexible national-wide universities with slow decision time and lack of willingness to change.

Therefore the conducive ecosystem model (fig.2) play much higher role in Latvia and we could map Entrepreneurial university model using extended Triple Helix model. It might be described by 3 logical stages:

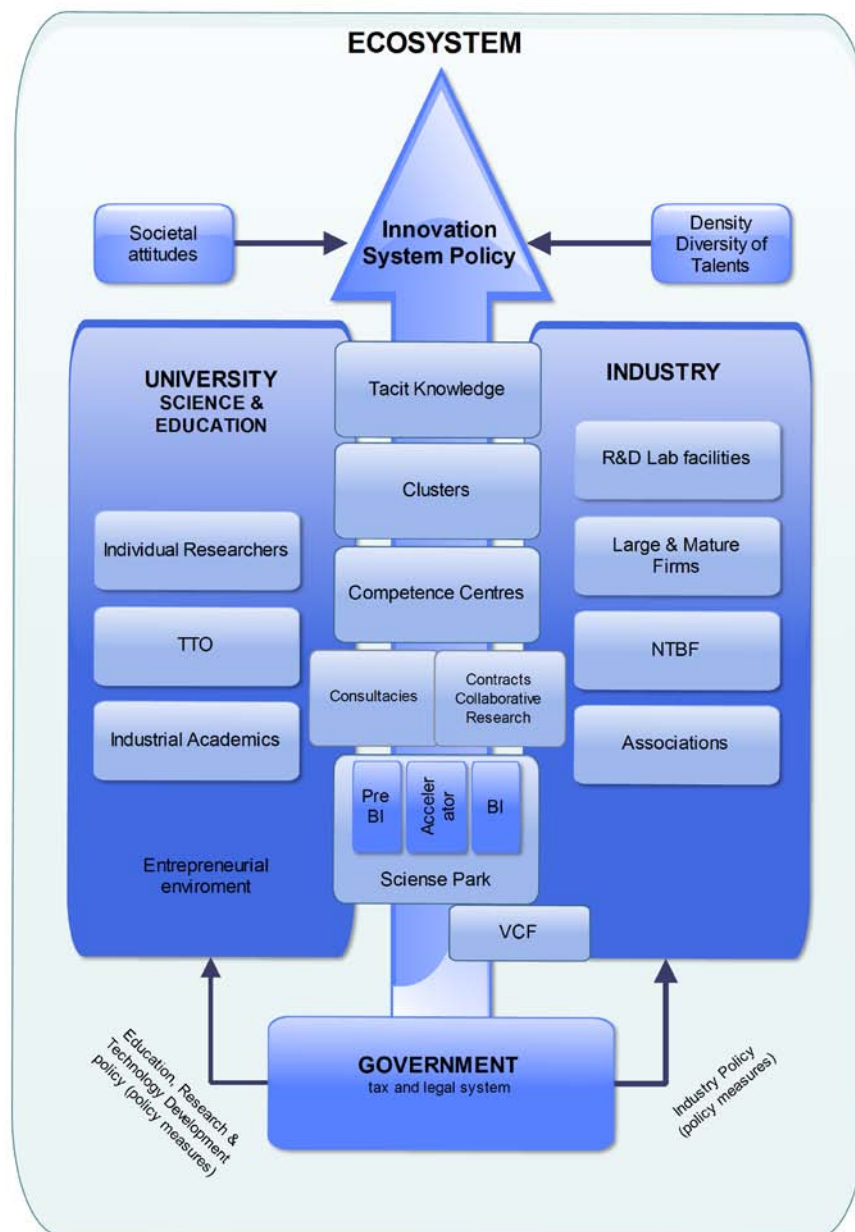
1. Entrepreneurial university with its first and second priorities: high quality education with integrated entrepreneurial education philosophy and open innovation system for new generated knowledge;
2. Clear intellectual property rights policy and conflict of interest policy;
3. Societal benefits and commercial return achieved as a result of interlinkages within efficient local innovation system: technology transfer by different channels.

**FIGURE 2**  
**FLOW OF NEW BUSINESS IDEAS AND ENTREPRENEURIAL CYCLE**



The scheme presented in Fig.3 describes how the main actors of the ecosystem interlinks and can have different roles or functions. Several authors - Etzkovitz H, Philpott K.; Dooley L., O'Reilly C., Lupton G., have tried to develop integrated in academic activities entrepreneurship models describing social return and benefits from public research. Collaboration between university and industry in innovative ecosystem has various channels and scheme outlines just important ones. Government designs Innovation policy where with limited available resources tries to achieve best performance by setting real targets and reachable significant outputs. Technology transfer channels reflect share of industrially oriented

**FIGURE 3**  
**CONDUCTIVE ECOSYSTEM AS A CATALYST TO AN**  
**ENTREPRENEURIAL UNIVERSITY MODEL**



academics, all forms of collaboration with industry, support to early stage entrepreneurship, and access to early stage risk finance. The main factors that influence this cooperation are: economic, educational policy, business support programs, business environment, availability, diversity and accessibility of talents etc.

To demonstrate the usefulness of this model in Latvian environment first we will provide background analysis of the national innovation system evolution, business environment, economic situation and developments in research and development. In this paper we understand innovation system as one where those who produce new knowledge are well connected with those who apply and efficiently use it.<sup>74</sup> and Goldberg et al. (2006).<sup>75</sup>

### **Evolution of National Innovation System and Innovation Policy in Latvia**

The period since the collapse of the Soviet Union and the transformation from a command economy system to a market economy in 1990s, Latvia's accession to the EU is characterised by conforming neoliberal radical "Washington consensus" reforms package almost relying on market processes and rejection of economic regulation and state intervention. Nissinen (1999)<sup>76</sup>. The changes in R&D systems followed soon as a balance between IMF supported liberal – monetarist and more social and top-down based on EU policies.<sup>77</sup> Latvia despite deep economic recession and slow recovery in 1990ties implemented several radical structural reforms in R&D, like integrating majority of Academy of Science institutes within large universities (LU and RTU), but keeping soviet heritage and lacking western research governance standards and culture (design of feasibility studies, independent peer to peer review culture, massive internationalisation of professorship and students etc.).<sup>78</sup>

The strong shift to long term goals are based on knowledge governance, specialisation, regional development, creation of information society was adoption of sustainable development concept: Latvia: from vision to action in 2000.<sup>79</sup>

The first innovation policy in Latvia was designed before entering the EU as an answer to EU requirements in pre-accession period and was rather imitation or copy of EU policy then policy itself.<sup>80</sup> The first really serious policy document was WB NIS assessment in 2002 followed by RIS Latvia Strategy 2007-2013 evaluated as the EU best practice. As a follow-up of support in 2005-2006 for policy implementation provided by the EU Innovative Regions of Europe secretariat resulted in design of appr.10 new policy measure's concepts creating bases for further policy measure framework integrated in new competitiveness policy (unifying former SME, innovation, industry development and business environment promotion national level policies) and new national development plan. ESTER project helped to design risk capital industry development policy and as a first in CEEC establish Israeli Yozma-

---

<sup>74</sup> The Latvian National Innovation System – assesment of competitiveness and opportunities. The report submitted to LIAA. Inno Scandinavia AB, Stockholm, 2007, 40 p.

<sup>75</sup> Goldberg I., Trajtenberg M., Jaffe A., Muller T., Sunderland J., Armas E.B. Public financial support for commercial innovation. Europe and Central Asia Knowledge Economy Study Part I. World Bank, Chief Economist's Regional Working Paper Series, vol.1.no 1. WB, New York, 2006, 78 p.

<sup>76</sup> Nissinen M. Latvia's transition to a market economy. Political determinants of economic reform policy. Studies of Russia and East Europe. VTT and School of Slavonic and East European Studies, University of London, St.Martin's Press, Inc., New York, 309 p.

<sup>77</sup> Zile R., Steinbuka I., Počs R., Krūmiņš R., Ancāns H., Cērps U. Latvija uz XXI gadsimta sliekšņa.: ekonomika, finanses, integrācija. Rīga, Rhino Design, 1999, 152 p. (in Latvian).

<sup>78</sup> Kristapsons J., Martinson H., Dageyte I. Baltic R&D systems in transition. Experiences and future prospects. Rīga, Zinatne, 2003, 204 p.

<sup>79</sup> Latvia: from vision to action. Long term development conception. MoE, Rīga, 2000, 88 p.

<sup>80</sup> Dimza V. Inovācijas pasaulē, Eiropā, Latvijā. LZA Ekonomikas institūts, LZA, 2003, 205 p. (in Latvian).



model based fund of funds to promote privately managed risk capital fund industry<sup>81</sup> and Avotins (2006)<sup>82</sup>.

EU influenced innovation policy making by determining planning, implementation and monitoring of the EU PHARE program and structural funding policy rules and processes already in pre-accession period. In many cases the quality of state policies depended on quality of Phare program's supported external long-term consultants to government institutions. The comprehensive evaluation of Phare SME programmes efficiency in 10 countries<sup>83</sup> confirmed little value and low impact of EU investments in entrepreneurship and innovation promotion also in Latvia.<sup>84</sup> EU Integration Bureau before accession concentrated all coordination, development and decision making power thus taking over the monopoly role until entering into the EU and after of the Ministry of Finance (MoF) as main decisive body for development programs. Phare program ended in 2005 delivering to MoF complex and complicate for administration and control system for EU (Phare) fund management. Keeping on this approach lead to situation where the EU structural fund administration in last planning period with three level administration system was slow, bureaucratic (compared e.g. with FP7 procedures) and required in average three times more personnel per each aid Euro compared to e.g. Finland.

Latvia entered the EU with great differences in GDP and level of welfare (appr. half of EU average). Rule of free movement of people stimulated many economically active people to screen for better job opportunities in U.K. or Ireland resulting in substantial inflow of earnings up to 1-2% of GDP. Growing inflow of FDI from EU member countries and EU funds after accession together with easy accessible loans issued by Swedish and local banks to individuals lead to real estate bubble which started at high growth period 2004-2008 (e.g. "rich" years) when wages and real estate prices rapidly increased and local population changed perception from resistance to bank loan taking to become active borrowers. This was catalysed by intensive apartment and land sales to foreigners in Riga city and close surroundings, rocketing of public sector salaries, as well as transforming fixed apartment rent fees to free market ones thus catalysing real estate bubble. Latvia as a small economy in 2002 was characterised by World Bank (Watkins 2002) to be low cost, low tech, low value added economy which is very closely tied to the global economy. After the dramatic decrease of GDP by almost ¼ in 2008-2010 and sharp increase of unemployment during the downturn, economic activities in 2011 showed gradual GDP increase by 5.5%. For the past ten years, real GDP growth in Latvia has exceeded the average GDP growth rate in the EU countries. Ever since 2004, Latvia's GDP has increased by 10.4% on average annually and in 2007 Latvia's GDP increased by 10.3%.<sup>85</sup> Rise of exports up by 30% during post-crisis period is based on demand growth in trade partner countries but from extremely low level. The economy was warmed up by essential inflow of EU structural funds, resident foreign earnings and revival of domestic demand.<sup>86</sup> In 2012 Latvia faced the same challenges as many other EU countries: a slowdown of economic development, a need to reduce administrative expenses (in reality we saw opposite), and a government increasingly searching for measures to promote economic growth. The policies implemented in last

---

<sup>81</sup> Early stage investment triggering in Eastern regions. ESTER Final Report. Editor: V. Avotins. Investment and Development Agency of Latvia, Riga, 2005, 41 p.

<sup>82</sup> Avotins V., Calitis D., Sosars V. The creation of seed and venture capital sources in Latvia. In book: New strategies for innovation support. Ed. Mark Anderson, Peter Van der Sijde and Alfredo Mateos. University of Salamanca, Signum SGE, Salamanca, 2006, pp.181-193.

<sup>83</sup> An evaluation of Phare-financed programmes in support of SMEs. Final Synthesis Report. Monck Ch, ed. EC DG1A, February 2000, 171 p.

<sup>84</sup> An evaluation of Phare SME programmes. Kudela J.J. ed., Avotins V. EC DG1A 1999, 53 p.

<sup>85</sup> Economic Development of Latvia Report. MoE, Riga, December 2011, 144 p. [www.em.gov.lv](http://www.em.gov.lv), accessed at 25.05.2011.

<sup>86</sup> Economic Development of Latvia Report. MoE, Riga, December 2011, 144 p. [www.em.gov.lv](http://www.em.gov.lv), accessed at 25.05.2011.

decade finally resulted that at EU Innovation Scoreboard state's innovation performance aggregated map of 24 indicators Latvia was at the last place.<sup>87</sup>

This is due to continuously low investment in R&D (from 0.39 in 2003 to 0.60 % from GDP in 2010), the extremely small number of survived aging researchers (appr.2400 full time equivalent with half over age of 60)<sup>88</sup> and PhD graduates in natural sciences and engineering disciplines (30-40 annually), low share of product innovative companies (3-6% compared to 12-15% as EU average) provides really challenging picture. Watkins (2002) in his research "Creating a 21st Century National Innovation System for a 21st Century Latvian Economy" noted that country's research potential is losing critical mass to train new industrial researchers and engineers. The potential to support business need to acquire intangible knowledge and to contribute with applicable research services so crucial for creative imitation is critical. The total capacity of R&D personnel in Latvia is equivalent to the total R&D personnel in regional university in Sweden or in one mid-sized US laboratory.

Strong dependence on low cost subcontracting with a low share of high tech products in exports was followed by increasing regional disparities, decreasing education quality, lowering birth rate and high emigration outflow and brain drain.

Latvia is behind the EU and its Baltic neighbours in implementing smart innovation policies. When Estonia has set very clear policy goals and developed well-coordinated measures in 2002, Latvia from that up to present has strong coordination, division of tasks, organisational, procedural, fragmentation etc. reform challenges.<sup>89</sup> However, advance in quality of national innovation policy documents compared to Estonian or Lithuanian ones (Watkins 2002, RIS reports, National Development Plan for period 2007-2013) were lost by frequent replacement previous by other planning documents or lack of will, time, resources to efficiently implement policy measures. The local funds after last downturn were completely substituted by EU funds keeping only the same investment in R&D level without increase or more precise targeting. The launch of Knowledge and Innovation System Department at Investment and Development Agency of Latvia (LIAA)<sup>90</sup> at 2006 foreseen to take the role of future Technology Agency like TEKES in Finland, was closed down at 2009 as a result of new reform started by MoE in 2009 and melting stuff and functions between other LIAA departments. In 2012 LIAA has almost lost its competence to pretend to be Technology Agency as all former personnel has left agency. Weak policy implementation capacity, lack of resources allocated for policy implementation, broad and fragmented priorities together with frequent their change or mechanical assembly, strong political lobbying interests of narrow economic groups and high administrative bureaucracy of administrating EU fund programs are main reasons of poor innovation performance.

In 2010 the Ministry of Education and Science (MoES) promoted the concentration of research in 9 national importance research centres and introduced extreme approach of provision of funds for soft and hard measures on competitive performance indicators based project financing contracts in two stages. Firstly, all research institutes in 2011 passed performance (or excellence) evaluation and best ones were centrally invited by MoES to form 9 national significance research consortia. Secondly, all consortia submitted worked out their individual, spatial and collaborative development strategies. Uncertainty is in fact whether MoES will keep consolidation requirement also further on in upcoming calls or it stay as only isolated and partly formal initiative.

After crises Latvia like some other CEEC has stepped back from liberal market driven economy towards state led innovation policy models.<sup>91</sup> State innovation policy measures with too broad targets and

---

<sup>87</sup> Innovation Union Scoreboard 2011. Research and Innovation Union Scoreboard. EU, 2012, 101 p. [http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011\\_en.pdf](http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf), accessed at 28.05.2012.

<sup>88</sup> Watkins 2002 and Innovation Scoreboard 2011

<sup>89</sup> Karo E. The evolution of innovation policy governance systems and policy capacities in the Baltic States. *Journal of Baltic Studies*, vol.42, No.4, December, 2011, pp.511-536.

<sup>90</sup> See also [www.liaa.gov.lv](http://www.liaa.gov.lv)

<sup>91</sup> Karro E. (2011)

performance indicators sometimes permitted just to spend EU funds in such fuzzy continuing process with complex, heavy administrated and inflexible program procedures.

After a decade of WB report (Watkins 2002) we see almost the same situation when Latvia is similarly reliant on cheap labour intensive and low – tech industries with little demand for new knowledge. Today, economic development is often viewed as a technological phenomenon; for a lagging economy, it is seen as the phenomenon of catching up with technological advancements. Still, the fact remains that the generation of new frontier knowledge is concentrated in relatively few innovation driven countries able to concentrate required sizable resources.

Today, Latvia has based its knowledge economy policy on prioritair mix of knowledge-intensive and traditional sectors—information and communication technology, electronics, material science, wood processing, machinery, and biotechnology and pharmacology, while Estonia has set horizontal priorities.<sup>92</sup> High-technology sectors represent only 2% of the total workforce in Latvia, which is much lower than the average of 3.5% in existing and future EU member countries. Karnitis (2004)<sup>93</sup> emphasised growing role of network economy, “globalisation”, IT infrastructure and information society and knowledge governance as a base for Latvia’s innovation policy.

Comparative disadvantage, lack of the economy of the scale forces domestic businesses to search for economies of scope thus reducing cost gains per product as company increases count of products by reusing the same asset base, resource or competency. Researcher in personal contacts sees number of companies with such behaviour, especially in SME sector. Such behaviour does not lead to innovative and competitive products for bigger markets, because bigger markets require being best at least in something in order to be really successful.

Latvian industry still is driven by cost factors and its first priority is how to increase productivity levels. There are no new high growth innovative companies of national pride like Skype in Estonia. Open borders, technology development, Internet and social networks create even more new homogenous market spaces which are not limited to country or country union boundaries. Today social networks like *Facebook* can be considered as one of the biggest countries in the world with comfortable to customers information absorption environment.

The growing R&D spending in a future by peer-review evaluated international experts are well-performing at a few basic research institutions should be complemented with strengthening industrial or applied research component with technology absorption and technology commercialisation system and increase of innovation policy capacity.

Latvian enterprises are not concerned with investing in technology’s in-house development or adoption. The proposition demonstrates the statistics of European Union where Latvia’s indexes lag behind ES average in the all fields. The traditional model of technology transfer (PROs – industry) in Latvia has low performance. This cross-country comparison also emphasizes the limited participation of the Latvian private sector in the knowledge economy. Not only few private firms have been directly involved in the so-called knowledge intensive sectors but also the level of R&D effort funded by the private sector remains one of the lowest in Europe, accounting for only 0.2% of GDP, which is approximately six times lower than the EU average.

### **Social Profile of Small Entrepreneur in Latvia<sup>94</sup>**

Emergence of private sector, changes in law system, privatisation process liberated entrepreneurial activity of people in different levels. The first serious Latvia’s SME survey<sup>95</sup> showed that in 1998 share of entrepreneurs below 30 is appr. 9-13%, that up to 2/3 entrepreneurs are men, and average level of entrepreneur’s education is significantly higher compared to other CEEC. The typical small entrepreneur

---

<sup>92</sup> Karo E. (2011), p.523.

<sup>93</sup> Karnitis E. Informācijas sabiedrība – Latvijas iespējas un uzdrošināšanās. Rīga, Pētergailis, 2004, 208 p.

<sup>94</sup> In the context of this paper small and medium size enterprises are small compared to EU average figures

<sup>95</sup> Tisenkopfs T. Ed. 1998. Kā jūtas mazais uzņēmējs (in Latvian, How do feel small entrepreneur?). Institute of Philosophy and Sociology of University of Latvia, Riga

(Tissenkopfs 1998) is strongly individualistic with limited contacts with other entrepreneurs and only rarely (11-16%) establishing different collaborative forms with competitors, suppliers or buyers. Company structure is hierarchical and management style authoritarian. The older is chef then more dominate authoritarian style of leadership excluding question of his/her authority. Even middle manager has no power to decide or take initiative for negotiating contract. Entrepreneurs often are inward looking with low level of ambitions, poor management skills and Latvia-centric values and thinking (Nissinen 2002).<sup>96</sup>

According to Avotins (1998)<sup>97</sup> two thirds of entrepreneurs in Soviet time work and obtained first skills as managers or employed specialists, and started their first business as management buy-out. Such mode of privatisation when transferring all debts to new owner did not attracted additional capital, but opposite, made more pressure to profit and working capital. Only large and active companies in market were able to survive and start exports, the rest faced survival challenges and as a result of high inflation and low productivity many companies became insolvent and in many cases court appointed administrators sold novel technological machinery for metal waste price.<sup>98</sup> Several surveys (Tissenkopfs 1998, Avotins 2000,<sup>99</sup> RIS Latvia 2003<sup>100</sup>, LIAA 2007, MASOC 2005, LTC study etc.) showed that local entrepreneurs identify and count only external factors as bottlenecks for increase of their firm's competitiveness neglecting internal, depending on themselves as always is more easy to blame somebody else for failures.

Companies are occupied with short term revenue opportunity finding and in-house innovation execution, because they think universities cannot perform research for them, scientists are slow, there is information asymmetry and small size of business. (Latvia 2002)<sup>101</sup> The situation gradually improves with growing number of MBA graduates of Riga Business School, Stockholm School of Economics in Riga, Innovation Management MBA at Riga Technical University etc. The new western culture based graduates bring fresh knowledge often improved abroad or practised in foreign owned firms. However, the product innovative enterprises in Latvia are only 6.6% against 12-15% in developed countries.<sup>102</sup>

The Republic of Latvia urgently needs a new development policy and active technology transfer could be the cornerstone in it, where the high absorption capacity would be "the key".<sup>103</sup> The policy to promote external knowledge transfer and adoption,<sup>104</sup> incremental process and organisational innovations,<sup>105</sup> which would allow to revitalise knowledge-based national development strategies.

The innovation culture in companies and intermediates in average is undeveloped and as a consequence, ability of imitation, transfer and creative adoption of external knowledge is low.

<sup>96</sup> Nissinen M. (2002) The Baltics as a business location for information technology and electronic industries. VTT, Espoo, Research Notes 2169, 2002, 234 p.

<sup>97</sup> Avotins V., Azanda D., Baranovs O., Danusevics H., Tisenkopfs T. The State and the private sector: creating a better environment for development. In: Latvia Human Development Report, Tisenkopfs T., Chief Editor, 1998, chapter 4, pp.73-94.

<sup>98</sup> Rantiņš V., President of MASOC, personal communication, 2001.

<sup>99</sup> Avotins V., Birzulis J., Kušners E. Development of small and medium businesses in Latvia. A research paper on the influence of changes in legislation on business. Soros Foundation Latvia, Riga, AGB, 2000, 95 p.

<sup>100</sup> RIS Latvia 2003 need analysis

<sup>101</sup> Information Technology. Country profile –export potential. Latvia: 2002, UNCTAD ITC Geneva 2003, 202 p.

<sup>102</sup> 2006.-2008.years. CSB data, <http://data.csb.gov.lv/Dialog/Saveshow.asp>; accessed at 30.08.2011.

<sup>103</sup> Tovstulaks J., Avotins V., Jarohnovica N. Enterprise technology absorption readiness assessment model in Latvia. Abstracts of 7<sup>th</sup> Annual Int. Sci. Conf. New dimensions in the development of society, October 6-7, 2011, Jelgava, Latvia, p.56.

<sup>104</sup> The World Bank, "Korea: How Firms Use Knowledge, Part A – Firm Level Innovation in the Korean Economy", 2002, Washington

<sup>105</sup> Schipper T., Swets M. Innovative lean development. How to create, implement and maintain a learning culture using fast learning cycles. CRC Press, London, New York, 2010, 174 p.

### Case Introduction: Three Universities

Ventspils University College (VeUC) as a regional education centre was established in 1998, and today it serves appr. 900 students attending three faculties: in Management, Language studies, IT and in emerging new electronics department. VeUC has defined six main areas of research specialisations in astronomy and astrophysics, space technologies, high performance computing, electronics, applied economic research and applied language technologies. From this competitive research two collaborative clusters were established and pass early development stage: satellite technologies and applied language studies. According to the national strategy Competence Centre in Electronics with strong focus to space technologies and National Research Consortia for ICT and Signal Processing were recently established.

The VeUC innovation system includes pre-incubator, incubator, science park (Ventspils High Technology Park), Technology transfer Office. The model of VeUC innovation system is shown in Figure 2. This model shows commercialisation and collaboration outflow of VeUC research potential of entrepreneurial academics ideas, solutions, competence to industry.

VeUC was the first university in Latvia seriously thinking to establish efficient incubation system.<sup>106</sup> In 2011 new pre-incubator was established as a separate facility in business incubator and after two year operation's experience it has proved to be efficient measure to save resources, reduce risk, to assess market viability and reality of nascent entrepreneur business ideas.<sup>107</sup> The Business Incubator serves for up to 60 companies in knowledge intensive ICT, electronics, machinery and space areas; it has a branch incubator in Talsi city and it is a founder of Kurzeme incubator with incubator facilities in Liepaja, Kuldiga and Saldus. VeUC has implemented several cross-border projects with incubator and other Baltic science parks and universities to promote new techniques for new innovative business idea generation, design of training schemes for investor readiness and building networking with business angels, risk capitalists and financial intermediates.

In 2006 VeUC was among the first universities in Latvia to establish a targeted Technology Transfer Office (more precisely, Technology Transfer Contact Point (TTCP)). Its objective is to support commercialisation of VeUC IP potential, inventors, commercial contacts of researchers, industry collaborative activities, licensing, spin-offs and to operate as direct channel of interactions between academics and industry.

Since 2011 VeUC took the first steps in assessing its policies towards building entrepreneurial culture in university The Triple Helix model with interlinking components of education, science and industry has been suggested. Conducive to entrepreneurship local Ecosystem here plays more important role as usually is devoted to. It includes: Ventspils University College, Ventspils High Technology Park, Ventspils International Radio Astronomy Center, Pre-Incubator and Business Incubator in VeUC, Ventspils Technology Development Council and the Ventspils City Council. Ventspils city is diversifying its development strategy by promoting high-tech industry keeping updated transport and transit sector competitive advantages. Ventspils City Council is the main supporter of the innovation ecosystem and has invested appr. 9 million LVL in VeUC which is really outstanding case in CEEC.

Comparatively small in size is Ventspils University College with respective small total state education budget and limited guaranteed state funding for scientific institutions restricting curiosity research and strategic flexibility. The low quality of secondary educational system, brain drain, low birth rate, migration from regions to Higher Education Institutions based in capital Riga lead to low density of talent which seriously hamper the development not only in Ventspils city, but also in whole country. Gradual shift in teaching towards introduction of practical skills elements, entrepreneurial learning objects, increasing student and professor exchange and visiting foreign guest teachers, as well as increasing share of English language courses are in line of trajectory to Entrepreneurial university model.

---

<sup>106</sup> Avotiņš V., Zeps V. Critical conditions to establish efficient incubation cycle in Latvia. Book of abstracts of the XXI ISPIM Conference, Bilbao, Spain, 6-9 June, 2010. ISBN 978-952-214-925-1. Paper published in: Proceedings of The XXI ISPIM Conference, Huizingh K.R.E., Conn S., Torkkeli M. & Bitran I. (Eds.), 2010, Wiley Higher Education, on-CD, ISBN 978-952-214-926-8. [www.ispim.org](http://www.ispim.org).

<sup>107</sup> SibNet crossborder project, <http://www.sibnetwork.eu/?id=33> accessed at 25.05.2012.

TTO performs as the best in Latvia (see Table 1) but still has solid capacity to increase its performance. The new role of regional entrepreneurial skills centre has recently established lifelong learning centre.

With its 17,000 students, 13 faculties, more than 800 researchers and more than 20 research institutes University of Latvia (UL) represents itself as the largest comprehensive educational and leading research university in Latvia. The UL offers more than 150 state-accredited academic and professional study programmes. At University of Latvia research is conducted in over 50 research fields, thus representing four main areas of inquiry: the humanities, natural sciences, social sciences, and education sciences. The University of Latvia is renowned for its research on Latvian language studies, material science, information and communication technologies, process simulation and socio-economic, as well as environmental and health and medical science.

The institutes of the University of Latvia have longstanding research traditions, and they cooperate with their respective faculties. For instance, the Institute of Solid State Physics is a European Union 6th Framework Programme Center of Excellence, where advanced research is conducted on nanotechnologies, holography, and robot technologies; the Institute of Educational Research of the Faculty of Education and Psychology carries out comparative research on education in cooperation with approx. 50 countries all over the world.

The biggest technical and engineering university in Latvia is Riga Technical University (RTU). RTU has 8 faculties and 35 scientific institutes and it has one of the biggest numbers of students - 14746. RTU is an accredited, internationally recognised university providing high quality study programmes in engineering, technologies, computer sciences, natural and environmental sciences, architecture, building engineering, electronics and economics and business administration and carrying out extensive scientific research activities.

Research activity in RTU is an integral part of the study process and it has to be noted that many of the research programs are very important for the industry and economy of Latvia. RTU is one of oldest universities with long-lasting traditions in the engineering research area. RTU is comprised of 35 institutes, 49 departments, 35 divisions, 29 laboratories and 29 research centres. RTU manages the Latvian Technological Park and offers a favourable and encouraging environment for innovation and implements various projects of technology transfer.

The aim of the LTP is to support new technologically oriented and innovative entrepreneurship activities and their further development. LTP offers project management and consultancy services to managers and researchers regarding entrepreneurship and product development and assists in finding cooperation partners. LTP offers premises for starting business activities in small and medium-size industrial facilities.

The Innovation Centre (IC) of the UL has similar responsibilities like TTCP in VeUC. IC and also promotes cooperation between scientists and companies and commercialisation of selected research results.

In 2007 it planned to create two level technology promotion support system in Latvia: first level, more inward looking, represented by network of TTCPs and the second or international level TTO with highly skilled international personnel supported with finances to provide adequate assistance and grants for TTCP IP portfolio development. Unfortunately, MoE realised only one level thus essentially limiting services of TTCPs and weakening TT system in whole.

#### *Latvian Performance of University Research*

The economic downturn in 2008 caused an essential cut of the state R&D budget by 40% in 2 years (from 2008 till 2010) and was completely replaced by EU structural funds. The so-called guaranteed state's basic infrastructure budget was reduced by 69% and in 2011 constituted only 4% of the VIRAC total annual budget. Such strong dependence on project based budget planning and open competition projects locally and internationally suggest that all budget lines are strongly allocated and fixed, limiting any research flexibility for curiosity research, experimentation of new unproven problem-solving technical solutions or laboratory demonstration models, and as a result shifts collaboration with industry toward short term consultancies or contract research compared to long-term collaborative forms. There

are few organisations specialised in the provision of innovation and technology related services. Dominance of small and micro innovative companies requires specific and additional fine-tuned services to reach sustainable and high growth trend. Lack of specialised service providers, especially in R&D and technology areas and almost non-existing supply of such services reflects non-existing demand and market segment, which in its turn show lack of collaboration between academic and industry sectors.<sup>108</sup>

One of the most important objectives of university research is to strengthen the links between science and industry and to increase the commercialisation of new technologies as well as to support innovation which is the key driving force of economy. UL and RTU are active in patenting, fundamental researches and setting start-ups, but both have no results in licensing (see Table 1). This illustrates weak technology transfer capacity and traditions. The main problems are: lack of understanding, too teaching focus, “pure fundamental research approach” undeveloped innovation and entrepreneurial culture, information asymmetry and weak collaboration with industry in new product areas. All analysed universities are poor users of alumni potential for technology transfer. Low commercialisation performance in large universities heavily depends on MoES policies, demand and political capacity to implement strategic decisions. Quite often smart draft political decisions in real life turn in stagnation after academic lobbying. But even such malformed commercialised policy has influenced university strategies and forced changes, for example, Intellectual Protection policies.

**TABLE 1**  
**ACTUAL AND FORECASTED OUTCOMES OF THE VEUC, LU AND RTU\*\***

| <b>Metric</b>   | <b>VeUC</b> | <b>LU</b> | <b>RTU</b> |
|---|-------------|-----------|------------|
| Commercial offers   | 16          | 9         | 18         |
| New Patents (local and international)                     | 2           | 23        | 36         |
| License negotiated/sold                                   | 0           | 0         | 0          |
| Spin-offs   | 0           | 0         | 0          |
| Start-ups*  | 0           | 13        | 39         |
| BI firms benefitting from University                      | 8           | 0         | 0          |
| Industrial agreements                                     | 16          | 9         | 15         |
| Income generated from contract research and consultancies | 5           | 2         | 8          |
| Study courses with integrated entrepreneurial modules     |             | 6         | 14         |
| Available entrepreneurial training courses                |             | 6         | 2          |
| Industrial / normal PhD students                          | 16          | 89        | 569        |
| Research turnover in 2011, mill.LVL                       | 987 000     | 7 880 600 | 8 500 000  |

\* - only university related start-ups were presented (established by students, graduates, alumni or teaching / research stuff

\*\* - Authors are grateful to M. Neimanis and R. Reklaitis kindly providing respective statistics on LU and RTU.

The replacement of national budget financing to university research doesn't increase research performance. The case of VeUC ERI VSRC with its recent strong growth curve is outstanding and rather an exception if we keep into account the institute's ability to keep the line of ambitious aims and vision with results achieved within last two – three years. The average research institute or laboratory with few exceptions demonstrates lowering of performance levels. EU requirements to increase dramatic low value of public and private funding for research should be accompanied with the concentration of limited resources for internationally competitive research activities, smart competitive specialisation, labour division, decrease in number of research institutes and structures and green light to interdisciplinary

<sup>108</sup> Miezeris J., Smilga Z., Zaksa K., Avotins V. The challenge of Swedish experiences to model of innovations supporting services in Latvia. Proceedings of the Conference Baltic Dynamics 2004 “Knowledge based entrepreneurship. Innovation policy and dynamic development of knowledge-driven entrepreneurship”, Knowledge Economy Series, Italy, Effeelle Editori, 2005, pp.173-184.

research areas pushed by availability of local natural resources or demanded by competitive regional integrated industry.

## RESULTS AND IMPLICATIONS

The analysis in this paper indicates nearly all complex factors influencing channels and process of knowledge commercialisation in the context of polycentric regional development in a country with low share of process, organisational and product innovations. The model of the entrepreneurial university is analysed in Triple Helix framework, and a majority of factors are important in this way, were identified. Finally, new role of regional universities on a VeUC case study basis were discussed when resources are limited and technology absorption readiness is foreseen as one of priorities of regional or national innovation policy. This more complex approach allows better economic and social return from provincial knowledge centres and integrate them into regional development and convergence policies for new EU planning periods. Such policy should support a more active role that is more ready and willing to grow centres instead of splitting for absorption and social needs equally available funds in regions. We have analysed how poor capacity of local innovation and research policies and low performance of implemented activities fragmentise available resources, create resistance to required changes in environments and ecosystems, facilitating outflow of talent and encouraging brain migration and capital out of country.

The readiness to adopt a new model of an entrepreneurial university is validated by providing case analysis of three universities. The process of technology transfer and socio-economic return in the capital metropolis and the regions is very different. The dominating strategy in large universities is education supported by research only as a secondary sub-priority. The top level administration with the face of rector office is introducing top-down third priority which has low understanding by majority of academics whose career is determined by the number of publications in locally organised international scientific conferences. More active and competitive researchers are overloaded with lecturing, work in structural fund supported projects or projects within industry. Latvia is adapting the proposed knowledge management model in the university from other countries trying to encourage local industry. Most challenges for private sector are related to low productivity, lack of innovation and development of new products or businesses in sectors with high added value. The majority of enterprises are micro and small firms lacking critical mass to invest in R&D and ambitions to grow further.

A low number of employed researchers of which a large part of whom are aging together with a low number of PhD students together create extremely low capacity which is much below the needed level to implement structural economic reforms. Promotion of entrepreneurial education, new high growth innovative firms and high value added jobs generate and encourage an entrepreneurial and creative mindset among university academics. The growing role of regional knowledge centres should be strengthened implementing smart and competitive specialisation strategies in regions able to generate substantial return of investments, but in metropolis per-review analysis and consequent elaboration of detailed work plan for concentration of limited resources up to uniting labs, research institutes and HEIs or forcing start of tight (not formal) collaboration replacing today's activity parallelism, fragmentation and isolation.

Additional research is needed to investigate a model of regional innovation systems where priority is given to knowledge absorption readiness, and validated by case analysis of the VeUC. Obtained experience might lead to better adoption of entrepreneurial university models and could be used to assess core processes in a way of transformation of traditional teaching school strategy. It has become apparent that more social and economic value might be achieved from investments in education and research if the concentration of young talented people with entrepreneurial behaviour focus on innovation policy measures. If the environment and offers are not sufficient to keep locally talented people we cannot expect that we could compensate outflow of talents by returning or importing them. In the common EU market Latvia with its broad innovation policy measures would only become a transit corridor for highly skilled foreign people without capabilities to place them here for a longer time.



The change of university networks and transfer channels could drive further value to entrepreneurial and applied research, integrating open science. Whilst this paper examines the university within the context of becoming entrepreneurial and existing technology transfer channels, there exist opportunities that universities could use to generate additional value from their knowledge networks as the role of universities increases in national and regional innovation systems. Provincial HEI being sometimes the only knowledge centre in a region can essentially contribute in overall technology absorption readiness and firms' competitiveness. Further studies may be needed to assess the role of open innovation knowledge transfer processes compared to protected technology transfer processes based on the university developed innovation ecosystem. Additional research will be made to investigate further the proposed ecosystem environment facilitating efficient technology transfer and absorption ability in line with substantial local and national innovation policy capacity building.

## REFERENCES

An evaluation of Phare SME programmes. Kudela J.J. ed., Avotins V. EC DG1A 1999, 53

Audretsch D.B. (2007a) The entrepreneurial society, New York, Oxford University Press. And Audretsch D.B., Grilo I., Thurik A.R. (2007b) Handbook of research on entrepreneurship policy. Edward Elgar Publishing, Massachusetts, USA, 241.

Avotins V., Azanda D., Baranovs O., Danusevics H., Tisenkopfs T. The State and the private sector: creating a better environment for development. In: Latvia Human Development Report, Tisenkopfs T., Chief Editor, 1998, chapter 4, pp.73-94.

Avotins V., Birzulis J., Kušners E. Development of small and medium businesses in Latvia. A research paper on the influence of changes in legislation on business. Soros Foundation Latvia, Riga, AGB, 2000, 95.

Avotins V., Calitis D., Sosars V. The creation of seed and venture capital sources in Latvia. In book: New strategies for innovation support. Ed. Mark Anderson, Peter Van der Sijde and Alfredo Mateos. University of Salamanca, Signum SGE, Salamanca, 2006, pp.181-193.

Avotiņš V., Zeps V. Critical conditions to establish efficient incubation cycle in Latvia. Book of abstracts of the XXI ISPIM Conference, Bilbao, Spain, 6-9 June, 2010. ISBN 978-952-214-925-1. Paper published in: Proceedings of The XXI ISPIM Conference, Huizingh K.R.E., Conn S., Torkkeli M. & Bitran I. (Eds.), 2010, Wiley Higher Education, on-CD, ISBN 978-952-214-926-8. [www.ispim.org](http://www.ispim.org)

An evaluation of Phare-financed programmes in support of SMEs. Final Synthesis Report. Monck Ch, ed. EC DG1A, February 2000, 171.

Baldini N., Grimaldi R., Sobrero R. (2006) Institutional changes and the commercialisation of academic knowledge: a study of Italian universities' patenting activities between 1965 and 2002. Research Policy 35, 518-532.

Burton Clark, 1998, Creating entrepreneurial universities: Organizational pathways of transformation , p4. Pergamon Press.

Cohen W., Nelson R., Walsch J. (2000) Protecting their intellectual assets: appropriability conditions and why US manufacturing firms patent (or not). NBER Working Paper, No.7552.

- Coleman M., Cormican K. An exploration of open innovation in university technology transfer.
- Dimza V. Inovācijas pasaulē, Eiropā, Latvijā. LZA Ekonomikas institūts, LZA, 2003, 205 p. (in Latvian).
- Drucker P. Innovation and entrepreneurship. Practice and principles. HarperBusiness, New York, 2006, p.26.
- Early stage investment triggering in Eastern regions. ESTER Final Report. Editor: V. Avotins. Investment and Development Agency of Latvia, Riga, 2005, 41.
- Economic Development of Latvia Report. MoE, Riga, December 2011, 144 p. [www.em.gov.lv](http://www.em.gov.lv), accessed at 25.05.2011.
- Enkel E., Gassmann O., Chesbrough H. (2009) Open R&D and open innovation: exploring the phenomenon. *Journal of R&D Management* 39 (4), 2009, pp.311-316. Blackwell.
- Etzkowitz H., Leydesdorff L. (2001). Universities and the global knowledge economy. Continuum, London, 2001
- Etzkowitz H., Leydesdorff L. (2000). The Dynamics of Innovation: From National Systems and „Mode 2” to a Triple Helix of University-Industry-Government Relations, *Research Policy* 29.
- Etzkowitz L., Leydesdorff H. (1995). The triple helix: university-industry- government relations a laboratory for knowledge based economic development. *EASST Review*, vol.14 (1), March 1995. <http://www.easst.net/review/march1995/leydesdorff.shtml>
- Etzkowitz, H. (1983) Entrepreneurial Scientists and Entrepreneurial Universities in American Academic Science. Dordrecht, Holland: Minerva.
- EU (2006) Constructing regional advantage. Principles-perspectives-policies. EU, DG Research, 2006, 98
- Florida R. (2007). The flight of the creative class. The new global competition for talent. New York, HarperCollins Publishers, 326.
- Gibbons M. The New Production of Knowledge. for an in-depth exploration of the significance of networks in knowledge creation.
- Goldberg I., Trajtenberg M., Jaffe A., Muller T., Sunderland J., Armas E.B. Public financial support for commercial innovation. Europe and Central Asia Knowledge Economy Study Part I. World Bank, Chief Economist's Regional Working Paper Series, vol.1.no 1. WB, New York, 2006, 78.
- Goldfarb B., Henrekson M. Bottom-up versus top-down policies towards the commercialisation of university intellectual property. *Research Policy* 32 (2003) 639-658.
- Hindle K., Yencken J. Public research commercialisation, entrepreneurship and new technology based firms: an integrated model. *Technovation* 24 (2004) 793-803.
- Information Technology. Country profile –export potential. Latvia: 2002, UNCTAD ITC Geneva 2003, 202.

Innovateamerica. National Innovation Initiative report „Thriving in a world of challenge and change”, Council of Competitiveness, USA, 2004, 68.

Innovation Union Scoreboard 2011. Research and Innovation Union Scoreboard. EU, 2012, 101 p. [http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011\\_en.pdf](http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf), accessed at 28.05.2012.

Jacob M., Lundqvist M., Hellsmark H. Entrepreneurial transformations in the Swedish university system: the case of Chalmers University of Technology. *Research Policy* 32 (2003) 1555-1568.

Karo E. The evolution of innovation policy governance systems and policy capacities in the Baltic States. *Journal of Baltic Studies*, vol.42, No.4, December, 2011, pp.511-536.

Karnitis E. Informācijas sabiedrība – Latvijas iespējas un uzdrošināšanās. Rīga, Pētergailis, 2004, 208.

Kristapsons J., Martinson H., Dagyte I. Baltic R&D systems in transition. Experiences and future prospects. Riga, Zinatne, 2003, 204.

The KTH Entrepreneurial faculty Project. VINNOVA Report VR 2005:13, Stockholm, 2005, 128.

Latvia: from vision to action. Long term development conception. MoE, Riga, 2000, 88.

The Latvian National Innovation System – assesment of competitiveness and opportunities. The report submitted to LIAA. Inno Scandinavia AB, Stockholm, 2007, 40.

Leydesdorff L., Meyer M. Triple helix indicators of knowledge-based innovation systems. Introduction to the special issue. *Research Policy*, 35 (2006) 1441-1449.

Maskus K. Encouraging international technology transfer. Project on IPRs and sustainable development, Issue Paper No.7. ICTSD and UNCTAD, France, 2004, Cyclus Print, 50.

Miezeris J., Smilga Z., Zaksa K., Avotins V. The challenge of Swedish experiences to model of innovations supporting services in Latvia. Proceedings of the Conference Baltic Dynamics 2004 “Knowledge based entrepreneurship. Innovation policy and dynamic development of knowledge-driven entrepreneurship”, Knowledge Economy Series, Italy, Effeelle Editori, 2005, pp.173-184.

Nissinen M. Latvia’s transition to a market economy. Political determinants of economic reform policy. Studies of Russia and East Europe. VTT and School of Slavonic and East European Studies, University of London, St.Martin’ s Press, Inc., New York, 309.

Nissinen M. (2002) The Baltics as a business location for information technology and electronic industries. VTT, Espoo, Research Notes 2169,2002, 234.

Organisation for Economic Co-operation and Development (1999) The Response of Higher Education Institutions to Regional Needs. Paris: OECD/Institutional Management in Higher Education programme.

Perkmann M., King Z., Pavelin S. Engaging excellence? Effects of faculty quality on university engagement with industry. *Research Policy*, 40 (2011) 539-552.

Philpott K., Dooley L., O’Reilly C., Lupton G. The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31, 2011, 161-170.

Philpott K., Dooley L., O'Reilly C., Lupton G. The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31, 2011, 161-170.

Powers J. R&D funding sources and university technology transfer: what is stimulating universities to be more entrepreneurial. *Research in Higher Education*, 45 (1).

Rantiņš V., President of MASOC, personal communication, 2001.

Reiner R., Sievers U. Pre-incubation: new concepts to support start-up activities of universities and research institutes. PP.97-108. Broadfoot Ch., Sheen M. Towards best practice in (pre-)incubation. PP.77-84. and Steffens J., Traude A. The Bielefeld concept of pre-incubation. In: *New concepts for academic entrepreneurship. Proceedings of the USE-it! Conference*, Editors Van der Sijde P., Wirsing B., Ridder A. 2002, Twente University Press, Enschede, The Netherlands, 179.

Schipper T., Swets M. Innovative lean development. How to create, implement and maintain a learning culture using fast learning cycles. CRC Press, London, New York, 2010, 174.

SibNet crossborder project, <http://www.sibnetwork.eu/?id=33> accessed at 25.05.2012.

Siegel D.S., Waldman D.A., Atwater L.E., Link A.N. Commercial knowledge transfers from universities to firms: improving the effectiveness of university-industry collaboration. *Journal of High Technology Management Research* 14 (2003) 111-133.

Thorp H. And Goldstein B. Engines of innovation. The entrepreneurial university in the Twenty-First century. North Carolina Univ.Press., Chapel Hill, 2010, 170.

Thursby J., Thursby M. (2007) University licensing. *Oxford Review of Economic Policy*, vol. 23, No.4, 2007, pp.620-639, Oxford University Press.

Tisenkopfs T. Ed. 1998. *Kā jūtas mazais uzņēmējs* (in Latvian, How do feel small entrepreneur?). Institute of Philosophie and Sociologie of University of Latvia, Riga.

Tovstulaks J., Avotins V., Jarohnovica N. Enterprise technology absorption readiness assessment model in Latvia. Abstracts of 7<sup>th</sup> Annual Int. Sci. Conf. New dimensions in the development of society, October 6-7, 2011, Jelgava, Latvia, p.56.

Wood M.S. A process model of academic entrepreneurship. *Business Horizons* (2011) 54, 153-161.

The World Bank, "Korea: How Firms Use Knowledge, Part A – Firm Level Innovation in the Korean Economy", 2002, Washington.

Zile R., Steinbuka I., Počs R., Krūmiņš R., Ancāns H., Cērps U. *Latvija uz XXI gadsimta sliekšņa.: ekonomika, finanses, integrācija*. Rīga, rhino Design, 1999, 152 p. (in Latvian).