University and Industry Relationships

The role of universities in cluster development

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Introduction

Over the recent decades there have been increasing efforts by developing countries to reduce the economic gap between developed and developing countries. Asian and Northern European countries demonstrate good progress in these areas. Sweden, Denmark, China show stable high economic indicators that have been achieved by targeted government programs. These programs were aimed at creating a new type of economy based on knowledge and new technologies. Given the success of these countries, a number of developing countries, whose economies are dependent on resources, today, are looking to repeat their way; those countries are Russia, Indonesia, Brazil and Chile. The modernization of the economy and the formation of innovative economy are key objectives of the state policies of these countries. The research by leading economists and scientists led to the conclusion that the regional level of national economy plays a key role in formation of knowledgebase economy, which indicates the need to differentiate the innovation policy of the state depending on the economy parameters of each region.

Clusters are a powerful tool for achieving industrial and innovation development, enhancing market competitiveness and improving economical growth. The cluster approach for national socio-economic development of regions is becoming more popular among advanced foreign countries. This approach is defined either as a part of innovative policy or as a “cluster policy” itself.
The modern version of theory of clusters was formed at the end of XXth century by M.Porter, however the idea of clusters originates from the theory of industrial ditricts published by A. Marshall, J.Bekkattini, E.Markusen. M. Porter considers clusters as a crushial contributor to economic development of the regions. T. Andersen (Andersson et al., 2004) distinguished clusters by following factors: synergetic effect because of the geographical concentration of professionals in same or similar activities, specialized enterprises and organizations, actively involved economic agents, competition and cooperation, unique life-cycle, involvement in innovative process.

M. Porter's theory has evolved due to a significant contribution of western economists:

1. Paul Krugman has mathematically proved geographical concentration to positively influence on manufacturing; based on that he formed a concept of «core-periphery».

2. M. Enright stood for a concept that competitiveness should be developed at a regional rather than national level. Interested in regional economy, he defined clusters as an industrial cluster with high geographic concentration of companies. M. Enright emphasized the importance of interaction between companies as a key driver of individual competitive advantages.

3. E. Feser studied clusters as a driver of innovative development of the regions. With E. Bergman, together they defined external factors, innovative environment, competition and dependence from the previous economic policy to be the key elements of the theory of clusters1.

1. Triple Helix Model and Cluster concept

Cluster formation is a long-term process demanding intensive collaboration between three key institutional elements: science, represented by universities, business-agents and government.

Strong competition between suppliers within a region is considered as a precondition for cluster formation. Beside that, speed and success of clusters depend on quality of interaction between research and development centers, and companies’ capability to find effective solutions for common issues. Therefore, these factors would become even more effective would they have been concentrated geographically, with prompt transport and communication connectivity.

1 Bergman, Feser, 1999
Cluster representatives can be considered within three major elements:

**Corporate**

These are companies and organisation with various profiles and specialization: representatives of the main cluster's focus, suppliers of goods and services supporting clusters at operational level (transportation, energy, engineering, ecology and information and telecommunicational structures), companies specialized on professional financial services (audit, credit services, risk management, insurances, leasing, etc.), non-profit organisations, chambers of commerce and industry.

**Government**

Regional authorities, municipal and regional development centers, small and medium enterprise development funds.

**Science**

Universities, high-schools, science and development organisations, such as business-incubators, science parks, industrials parks, venture funds, design centers, centers for elaboration and commercialization of new technologies and etc. These elements support the infrastructure and innovations.

For cluster formation and its further progress collaboration of these three elements (science, government, business) is crucial: «Within an intensive interaction and collaboration three agents start coevolution by connecting their functions; as a result it will help clusters to facilitate self-development processes»³. «During the interaction three agents which are involved in the process of co-evolution bring their functional areas together and provide the cluster with opportunity for dynamic self-development.». Doctor S. Record mentions⁴ that if one of three elements is not represented there, cluster formation will become impossible.

However H. Etzkowitz emphasizes universities (including research and development elements) to play the most important role in cluster formation and to become a crucial element for high-technology production.

Contribution of universities can be classified as following⁵:

1. Universities plays an important role as an employer,
2. Regional development through a technological transfer support (technoparks, incubators, consulting),

3. Education (professional education, trainings and etc.).

Each of these directions has its own responsibilities and key activities (image 1)

**Image 1. Functions of universities in cluster framework**

**Source: designed by authors**

Following this concept, the «ideal» model of universities in cluster framework can be represented as:
However the described process can happen only in case of well-developed infrastructure and programs focused on entrepreneurship and innovation.

2. Model of Russian university as a member of the cluster

Recently in Russia there has been a shift from the concept of the policy framework to the practical measures supporting cluster initiatives. The concept of long-term socio-economic development and strategies of innovative development of Russia, established for the period up to 2020, provides that cluster policy will stimulate the growth of business competitiveness through the effective interaction of cluster members, improved access to innovation, technology, know-how, specialized services and highly qualified personnel, reduction of transaction costs, and implementation of joint cooperation projects [Kutsenko E.S.]

Research

In accordance with the Government Order of Russian Federation on 17.11.2008 No 1662-p, in 2012 the process to support clusters was designed in order to initiate formation of innovative clusters.

As a result, 25 clusters were formed. Each of them met requirements to be science-oriented, have an industrial capacity, include elements of operational support (transport, engineering, electricity and etc). University students and graduates have to be members of a cluster as well. As a result, these 25 clusters represent three main categories:
1. Highly scientific clusters with corporations or big enterprises in the center,
2. Clusters with high concentration of small business,
3. Clusters with majority members represented by scientific organizations.

Among 25 clusters science elements are represented by 52 universities.

In this research the role of universities in clusters was analyzed in order to moderate an averaged model of the Russian university activities within the cluster. The model building was carried out in several stages.

**Step 1. Role of Universities in Clusters**

Within cluster framework universities are responsible for providing education, conducting R&D and initiating entrepreneurship.

In terms of educational area, universities aim to provide a qualitative employment for its students. Universities develop special programs in order to develop certain skills and interests, based on current business needs of cluster’s stakeholders.

Beside ordinary educational goals, universities actively utilize its high level of science and R&D capacity. This is achieved by collaboration with business network. Participation in R&D projects, organization of internships and support with employment, help universities to expand the network. Hence, it works not only one-way round: good business ideas and projects born out of the university, for example students' projects, also can grow into a valuable product or service. Developed infrastructure is a key requirement for universities when it comes to R&D function: labs for technological and engineering needs, cooperation with other universities including exchange programs abroad, and etc.

Innovation and entrepreneurship function is evaluated within following criteria: infrastructure (whether there are required elements or not), protection of intellectual property, consulting, examination of existing projects, network and partnership with business units, transfer the results of R&D to market through licensing and start-ups.

Each of described activities was evaluated based on information available in open-sources: university web-sites, official reports and etc.

**Step 2. Universities with limited available information**

Some universities are tend not to disclose information regarding direction and focus of the researches. Besides information about their partnerships and business network is limited,
facts on the level of involvement of students in R&D are also not available. Universities that uncover less than 25% of information about their activities were eliminated from the research. Therefore 12 universities totally were suspended.

Step 3. Evaluation

Every activity and university function was estimated by the three-point scale: 0 – no information, or poor developed function, 1 – function developed at a level below an average, 2 – average level of development, 3 – well-developed function. Examination was conducted by representatives of university network, business stakeholders, experts from administrative and government level.

Step 4. Calculation and estimation

Results were calculated by finding a total score per each function.

Step 5. Representation of results

Results are shown in descending order per each function. (Table 1)

Table 1.

Role of universities in cluster framework in Russia.

<table>
<thead>
<tr>
<th>Name of function</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Additional education, professional programs, training</td>
<td>112</td>
</tr>
<tr>
<td>Round tables, conferences, seminars</td>
<td>71</td>
</tr>
<tr>
<td>Facilitating exchange programs, internships, support with employment</td>
<td>47</td>
</tr>
<tr>
<td>Duble-degree diplomas</td>
<td>43</td>
</tr>
<tr>
<td>Educational programs developed through cooperation with business units</td>
<td>38</td>
</tr>
<tr>
<td>Employment contracts</td>
<td>34</td>
</tr>
<tr>
<td><strong>Research and development</strong></td>
<td>402</td>
</tr>
<tr>
<td>Publications</td>
<td>77</td>
</tr>
<tr>
<td>Network with other universities</td>
<td>67</td>
</tr>
<tr>
<td>Academic mobility</td>
<td>62</td>
</tr>
<tr>
<td>Labs</td>
<td>61</td>
</tr>
<tr>
<td>Researches requested by companies</td>
<td>47</td>
</tr>
<tr>
<td>Competitions emphasizing student proficiency</td>
<td>39</td>
</tr>
<tr>
<td>Invo;vement of students in R&amp;D</td>
<td>28</td>
</tr>
<tr>
<td>Shared labs with copmanies</td>
<td>21</td>
</tr>
</tbody>
</table>
3. Results and Recommendations of the conducted analyzes

1. Russian universities are mainly focus on educational and R&D functions, while the importance of innovation and technology is underestimated. Innovation is still a new stream in Russian development, and government has started to support and catalyze its development relatively recently.

2. In terms of educational function, universities pay attention at importance in being involved in conferences, seminars, round tables, as well as stimulating internships for its students.

   Yet such important activities as launching educational programs together with business agents and an employment support are not represented fully. This is a matter of high importance and future efficiency of clusters: students have to be ready to work together with companies, and amount of hours dedicated by business agents for to developing soft-skills has to be minimized.

3. There are less R&D activities than educational currently in universities. However universities actively support students in publishing their articles: publishing (in russian language) received the highest score in conducted analyzes. Universities shall pay more attention to importance of collaboration with foreign universities as well: academic mobility is not strong enough due to unstable economic situation, expensiveness, and currency exchange history.

   Number of R&D projects initiated by companies has increased recently and study shows students are actively involved in it. However in majority of cases students do not receive payment, or fee is low.

3. Innovation and entrepreneurship function is not fully realized. Study showed that consulting, examination and market research services are poorly developed. Only 3 from 40 universities provide examination services (Lomonosov Moscow State University, The Institute
of Information Technologies, Mechanics and Optics (ITMO), Saint Petersburg State University).

Lots of attention has been payed by universities to patent system. Number of received patents per year is high, however most of them are not international. These patents are not profitable since mechanisms of licenzing and spin-offs are not developed well. Study showed that after receiving patent steakholders face number of difficulties preventing them from next steps: licensing by third party is not popular, academic careers do not benefir from patents, there is no financial motivation either since patent doesn't bring revenews to its holders.

All these findongs show that even potential benefits are high, universites currently miss an opportunity.

**Recommendations**

To improve efficiency of clusters and enhance role of universities, following recommendations should be considered.

*To improve educational function:*

1. Development of modern infrastructure.

   In order to modernize current educational system e-learning system has to be developed: there should be an opportunity to receive teaching materials and video-lectures on-line. Hardwear (facilities) of the universities also should be reconstructed; classrooms require computers; educational process shall step towards digitalization.

   These will improve brand status of the university, increase awareness about it, and later on will attract more students and future members of clusters.

2. Higher quality of teaching staff.

   Teachers and professors should start participate in international conferences, collaboration with companies, gain experience from exchange programs at foreign universities. Goverment has started already to allocate funds from the federal budget in order to increase proffecional level among professors.

3. Trainings together with enterprises.

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6 Federal law from 27.07.2010 №125-FZ "On Higher and Postgraduate Professional Education"
To create professional environment in universities business agents should be actively involved in educational process. First of all some programs have to be modified according to the interest and focus of business stakeholders. Secondary received theoretical knowledge shall be supported by internships and projects at related companies. Diplomas and theses have to be written based on real practice and experience of business agents. All together it will help to create generation of students ready to work at the intersection of science and business.

To make this happen clusters need to establish a special operational units coordinating continius cooperation between business and universities.

_To enhance research and development function:_

1. Developing capacity of young scientists.

To save and develop talents in science it is required to create qualitative R&D centers, provide research labs with necessary equipment, develop flexible and loyal system of grant distribution.

2. Stimulating R&D activities among students.

Following recommendations might improve current situation: it is important eductaional process to require R&D performance among students officially, ensure the participation of students in the implementation of the state budget or economic contracts themes in their works with the individual implementation plan, encourage participation in seminars, conferences and competitions.

_To create efficient and progressive entrepreneurship function:_

1. Integration processes and interaction between universities and business.

Involvement of business communities in science and stimulating collaboration between science and business are matters of the first priority.

2. Launching commercial activities and programs in universities.

Having consulting, examination and market research services will start the beginning of entrepreneurship awareness and interest in universities.

Universities own the most important resource for clusters – intelligent and highly professional human resources. However it is necessary to create separate unit responsible for services university will execute for business representative. In case of market researches, Center of Marketing will select the best matching faculty members and students to run specific projects.
Before launching such centers it is important to educate faculty members on how to run the Market Research professionally and to operate the Center.

3. Lowering the patent fees for educational institutions.

Patent fees is currently a number one issue preventing faculty members from basic steps towards commercialization of R&D results.

4. Tax cuts for the small enterprises created within universities.

It is necessary to introduce measures of tax incentives to reduce the tax burden on small innovative enterprise.

Conclusion

The university can be an active participant of the cluster strategy when performing all three functions (educational, research and business). According to the concept of the theory of Triple Helix, the university can pick up other participants’ functions in the cluster development. Potentially University can become a driver of scientific and technological cluster development, but there are examples where a cluster develops efficiently without the participation of universities.
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