Innovative education clusters and the experience of their building in Tatarstan Republic

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The paper describes the policy and practice the system of educational clusters in the Republic of Tatarstan (on the background of the corresponding global experience) with a focus on institutional system and principle of the triple helix (Triple Helix Model elaborated by Etzkowitz and Leydesdorf). For the example in this paper Education Cluster in the energy sector is examined, as this sector is one of the leading in the regional economy.

Keywords: clusters of innovative educational, scientific and industrial clusters, the triple helix model, MIT cluster synergies.

1. Introduction

Analysis of the current status of the various sectors of the industry in different countries has shown that combining efforts and resources is the best way to address issues related to globalization and the increasing dynamism of social and economic change. The successful development of the region is directly dependent on the quality of education and innovation as a key driver of competitiveness of the country. Experience in Europe, North America and Southeast Asia shows that in most countries around the world , especially in Europe , the clusters [1, 2] are now a key tool for the transfer of various types of economic systems to more sustainable development. Recently it has begun to form specific types of clusters, which, according to Porter's classification [8] are a special type of clusters [unconventional type] — educational clusters (EC).

This type of clustering is based on the triple helix model [9], with its inherent structural and characteristic features. Therefore, the problem of today is study of the complex issues associated with EC as a basis for improving the region's competitiveness in terms of the cluster approach. The paper objective is to highlight advantages of using the cluster approach to regional socio-economic system, and in particular of the education cluster as support for the existing system of higher education and continuing professional education.

2. The cluster approach in the regional economy

A. The points of growth of the Volga Federal District.

Since the last century in the world economy there is a growing interest for the role of spatial location (M. Weber, A. Griboyedov, A Marshall, A. Smith, F. Peru, J. Boudevilliers , P. Potier and R. Lasuena, A. Granberg [1-6]). M. Porter defines a cluster as «a geographically concentrated groups of interconnected companies, suppliers, related organizations and firms in certain areas of competing, but at the same time working together» [3].

Combining the efforts of entrepreneurs, governments, entities of investment and innovation activity in a particular area offers significant advantages in the competition, promotes streamline production, market processes and risks redistribution and provides policy flexibility needed in a rapidly changing market conditions.

The practice of clustering is typical for the Volga Territorial District. In recent years, it was formed a system of innovative regional clusters, growth points of which are presented in Table 1.

According to the data it can be concluded that the Tatarstan Republic has a largest share of implemented technologies and products in the areas of petrochemistry, oil refining and automotive industry from.

B. Cluster approach in the Republic of Tatarstan.

At present, a comprehensive «Strategy of development and distribution of productive forces of the Tatarstan Republic up to 2030 based on the cluster approach» is developed, which provides for the development of industry

Table 1

Growth points of the Volga Federal District

	Growth points of the Volga Federal District	Increase p. a., %
a)	Petrochemistry	35% (about 2,000 billion rub. p. a.)
b)	Biotechnology, Pharmaceutical and honey. industry	
c)	Automotive industry	36% (about 800 billion rub. p. a.)
d)	Aircraft industry	
e)	Engine engineering and building	22% (about 250 billion rub. p. a.)
f)	Research, development and production in the field of IT technologies, new materials and nanotechnology, new energy, complex engineering	

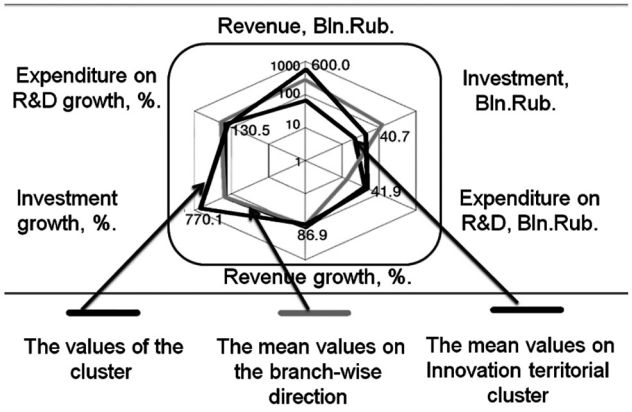

Figure 1. The main parameters of the Kama innovative regional-production clusters

and educational clusters consisting mainly of the following elements: anchor enterprise of a cluster, enterprise-satellites of a cluster, educational institutions, research institutes and construction departments.

The Government of the Republic successfully has formed a network of techno- and industrial-parks that are the basis of regional innovation clusters creating in various industrial sectors — petrochemistry, energy, automobile and aircraft industry. For example, Kama innovative regional-production cluster, the parameters of which are shown in Figure 1 [7].

For today in the Republic signed 14 agreements on state-corporate partnership in the field of staff-training through research-educational clusters (Table 2).

Also, in the Tatarstan Republic educational clusters are created, the main purpose of which is to improve the educational and scientific processes (Table 3). Universities in these types of clusters play a major role and the business activity is a factor that increases the quality of the educational process.

Thus, in the Tatarstan Republic outlined a positive upward trend for regional research-educational clusters growth and the emergence of educational clusters, which contributes to increased investment in the region, business efficiency and competitiveness of the region through development of infrastructure and the emergence of new firms.

3. Educational clusters

A. Global trends.

Education Cluster is the system of professional education (vocational) institutions with partnerships relations of business organizations, public authorities, companies with the aim of providing educational services as the main result (product or service) of the cluster.

All currently existing clusters by activity profile can be divided into two types (Table 2, 3):

- Scientific-educational or industrial clusters;
- Educational clusters.

This type of cluster M. Porter regards as unconventional type and represent the major ones models — MIT and Harvard (Figure 3) [8].

Table 2

Scientific-educational clusters of the Tatarstan Republic

№	Scientific-educational clusters	Maintaining ministry
1	Production and transportation of oil and gas. Petrochemistry and Refining	The Ministry of Economy and Industry
2	High Technologies industry	
3	Power production and Energy	
4	Engineering industry	
5	Aircraft industry	
6	Light industry	
7	Agricultural Complex	The Ministry of Agriculture and Provisions supply
8	Construction, Architecture and Housing and Utilities	The Ministry of Construction, Architecture and Housing and Utilities
9	Trade and service sector	The Ministry of Trade и Foreign and Economic Cooperation
10	Transport and roads sector	The Ministry of Transport and roads sector
11	Informatization and Communication	The Ministry of Informatization and Communication
12	Education	The Ministry of Education and Science
13	Health care	The Ministry of Health care
14	Culture and Art	The Ministry of Culture

At the center of this cluster is the educational process. Business activity in it is a factor that enhances the quality of education. Education at MIT or Harvard not only successful business, educational and scientific process has independent value at the same time. These schools attract a large number of students from all U.S. states and other countries. Their scientific work abundantly financed by the state and private entities. Endowment (budget, resources) of Harvard was about 37 billion dollars; MIT was about 11 billion dollars at the end of 2008. In addition to finance support the higher education in Massachusetts is based on schooling, that is also stronger relatively to other states.

Table 3

Educational clusters of the Tatarstan Republic

	Educational clusters
1	Kazan (Federal) Volga University
2	Tupolev Kazan State Technical University
3	Kazan State Technological University
4	Kazan State Medical University, Federal Agency for Health and Social Development
5	Kazan State Agrarian University
6	Kazan State University of Architecture and Civil Engineering
7	Kazan State Power Engineering University
8	Volga Region State Academy of Physical Culture, Sports and Tourism
9	Kazan State University of Culture and Arts
10	Russian State University of Trade and Economics
11	Naberezhnye Chelny State Pedagogical Institute
12	Zhiganova Kazan State Conservatory

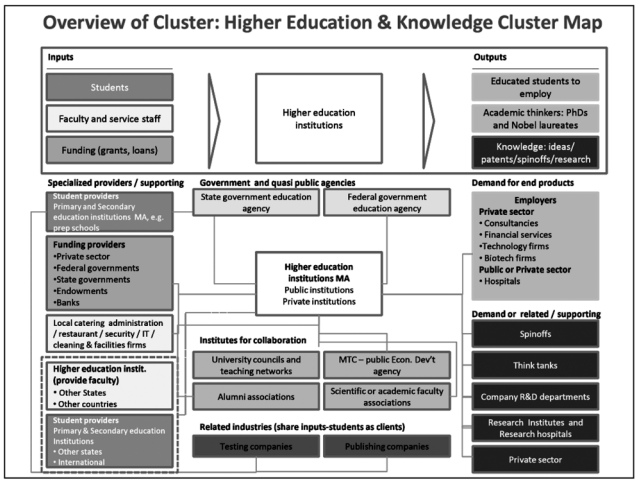

Figure 2. The Education Cluster model in Massachusetts

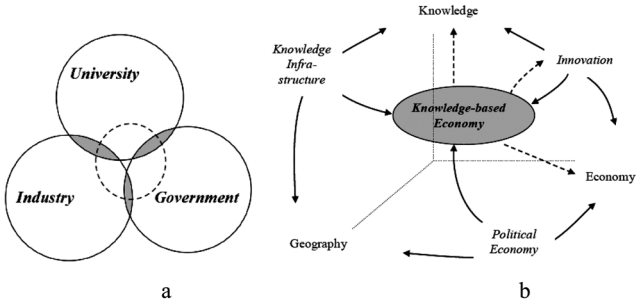

Figure 3. The triple helix model (a) and the synergy of the knowledge economy (b). The main functions are: the transfer of knowledge, network of new industries development within the sectors, regions and countries

Currently in Australia, UK, Germany, France, Russia, Spain, Italy, India, Canada, Malaysia, Norway, Republic of Korea, Singapore, USA, Finland, Sweden, Japan, and other countries there are attempts to reproduce the model of education cluster in Massachusetts (Figure 2). However, the secret of success of the Massachusetts cluster is that all innovation is generated within the framework of close cooperation and collaboration, i.e. a triple helix model (by Etzkowitz & Leydesdorff) [9].

In (Figure 3, a) is shown the architecture of the triple helix model and network mechanisms of neo-institutional economy (knowledge-based economy, figure 3, b). Important role of universities and close cooperation in the fields of economy, science and the state authority leads to the enhancing synergy (Godin and Gingras, 2000; Shinn, 2002, Etzkowitz, 2002; Mirowski, 2007).

The objectives of industrial clusters involving a university include: the commercialization of knowledge, training of employees of the companies, demand forming for R&D from the business and etc., that is, the main problem of industrial clusters is improving of the cluster and the region economic competitiveness. The main task of education cluster is to improve the quality of educational services at all levels (initial, vocational, secondary and tertiary) in the region. The business is a customer of the educational and research activities of the universities.

Thus, almost all clusters in which included universities (Table 2) belong to the industrial clusters type. But as shown in Table 3 the separate educational clusters are formed as well. Thus there is intercluster interaction, thereby increasing the efficiency of the whole cluster system in the region.

B. Energy Education Cluster of the Tatarstan Republic.

An active role in the formation and development of educational clusters (table 3) plays the Ministry of the Tatarstan Republic. As a center of modern training in the energy sector consider educational cluster of Kazan State Power Engineering University.

The objectives of educational cluster creating are: improving the efficiency and quality of education and training of highly qualified personnel, strengthening research and innovation, providing conditions for their implementation, improving efficiency of intellectual, material and information resources implementation for training and research in priority areas of education, science, culture, technology and social spheres. The implementation of this approach is illustrated in Figure 4.

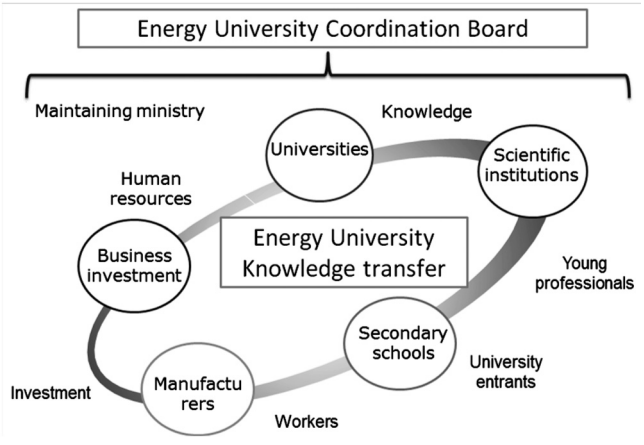

Figure 4. Model of education cluster

Factor Conditions • **Human Capital:** •+Primary & secondary education fairly strong because of charter and prep schools • - Limited capacity to attract more international students • **Financial Capital:** •+Strong supply of private capital to its elite private education institutions • + Stable government loans for students •- Public funding low in comparison with other countries	**Demand Conditions** • **Large and Sophisticated demand:** •+ Presence of sophisticated local demand, especially in high tech and medical industries •+ Access to national and foreign demand •+ Strong demand for knowledge of research institutions and hospitals reflected in increased licensing revenues, especially at MGH •**Limited job creation** •- Shrinking size local clusters that traditionally demand highly educated workforce
Context and Firm Rivalry • **First mover advantage (+)** • **Legislation:** • +Enabler of R&D, leading to great performers • - Restrictive immigration laws and cost of education in MA limit inflow of foreign students in comparison with other countries • **Competition and collaboration:** Highly ranked universities and institutions ave created both a collaborative and competitive environment in research, teaching, and other forms of knowledge creation	**Related and Supporting Industries** • **Vigorous business environment** •+Large and relatively innovative high-tech sector •+Strong levels of private-sector R&D but lagging Korea • +Great capital availability, especially in high-tech • +**Collaborative competition:** intense cooperation among peer institutions • **+Presence of functioning IFC** :that coordinates cooperation to improve business environment and drives economic development strategy • +/-Strong performance on spin offs but lagging California

Figure 5. Massachusetts Diamond: Competitiveness of Cluster

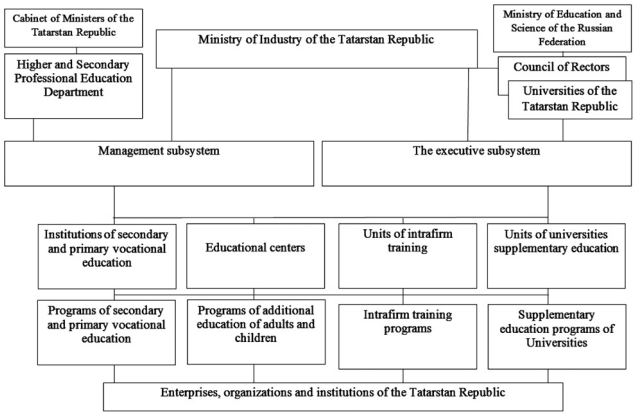

Figure 6. Continuing education in the Tatarstan Republic

In the Energy education cluster of Kazan State Power Engineering University involved colleges, partners (regional universities, international universities, foreign universities), specialized secondary schools (basic and specialized schools, technical schools, colleges, high schools), research institutions (Russian Academy of Sciences, the Academy of Sciences of Tatarstan, research and innovation centers, technology parks, training grounds), representatives of industry (holding companies, banks, investors, Co Ltd, private entrepreneurs) in order to implement innovative energy education.

Continuing Education System in the Tatarstan Republic (Figure 6) is realized by the interaction of Sectoral Ministries, the Ministry of Education of Tatarstan, universities, training centers and retraining programs, businesses, organizations, centers of responsibility for personnel policy in the sectors of the economy, that implement: program of further education, internal training and higher education [10].

Therefore, formed the horizontal and vertical linkages produce synergies and facilitate collaboration between educational institutions. That is, at the same time existing in a competitive environment, universities have to work together in framework developing of the Porter's diamond model (Figure 5).

Conclusions

Clusters are points of growth for the country economy of the domestic market, directly related to the innovative products creation and export. In the Tatarstan successfully developing industrial (scientific-educational) and emerged education clusters, in which the universities plays are key role and take part in intercluster interaction, thereby increasing the efficiency of the whole cluster system in the region.

Innovative features of the clusters emerged in the creation of new goods and values, i.e. synergistic effects, which depend on their institutional arrangements (regardless of their size and profile) and are the result of collective action based on collaboration. In other words, innovative clusters are agglomerations of developed networks connections [11], designed for interactive innovation (N. Smorodinskaya. Territorial innovation clusters: global orientation and the realities of Russia).

Developed on the basis of the university complex model of Energy educational innovation cluster should be scientific and methodological basis for synergies to improve the quality of continuing professional education of the Tatarstan Republic, concentrating the best scientific and pedagogical staff, the most modern and high-quality scientific and educational equipment, to become a» growth point» to further improvement the structure and quality of education system.

As a recommendation for further study it would be mentioned. Currently, the complication of the economy, technology leads to a complication of the innovation process, which covers a wider range of activities, organizing new connections, cross-connections, etc., i. e. emerged a network economy (The Internet Galaxy, Reflections on the Internet, Business and Society. Oxford, Oxford University Press, 2001). The process of innovation emergence is generally considered more as a collective action based on the data links, collaborative environment and inter-system interactions that can be seen as a new phase of innovation clusters for which has yet to develop analytical methods for evaluation and analysis.

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Инновационные образовательные кластеры и опыт их создания в Республике Татарстан

А. М. Сагдатуллин, аспирант, кафедра автоматизации и информационных технологий, Альметьевский государственный нефтяной институт.

В докладе анализируется политика и практика создания системы образовательных кластеров в Республики Татарстан (на фоне соответствующего мирового опыта) с акцентом на их институциональное устройство и принцип тройной спирали (Triple Helix Model elaborated by Etzkowitz and Leydesdorf). В качестве примера подробно рассматривается образовательный кластер в сфере энергетики, поскольку этот сектор является одним из ведущих в экономике региона.

Ключевые слова: инновационные образовательные кластеры, научно-производственные кластеры, модель тройной спирали, MIT кластер, синергетическое взаимодействие.