Infrastructural Support for Development of the Territorial Petrochemical Cluster

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Abstract

The paper covers the issues relating to setting up and development of clustered formations in the petrochemical sector within one of the largest industrial regions of the Russian Federation as represented by the Republic of Tatarstan. In reliance on the best practice in setting up various innovative infrastructural elements as well as based on findings of the studies of possibilities and prerequisites of a petrochemical cluster formation within the territory of a particular municipal district, the authors offer a methodology for assessment of clusterization process effectiveness. Furthermore, a number of missing infrastructural elements are identified that are essential for successful operation of a cluster in the region.

Keywords: *region, clusterization, structure, elements, petrochemical cluster.*

1. Introduction

Presently, the most critical issue relating to development of various regional economic systems is to ensure continuous growth of competitiveness and improvement of production efficiency. This requirement necessitates both activation of conventional economic growth factors and sources and search for new ones. In terms of global economic science, special care has been recently given to various aspects associated with development of regional clusters, inclusive of setting up competitive clustered formations [1, 2], interaction of elements within a cluster and intracluster networking [3-7], methodology of assessment of clustered formations performance and estimation of an effect of a cluster formation on the regional economy [8, 9]; cluster mechanisms as well as instruments intended for giving a boost to clusterization [10-15] etc.

The clusterization approach to economy-related process management is an essential condition for effective growing of economy of any state. The accumulated world experience shows a number of convincing examples that reflect a high degree of efficiency of implemented cluster-oriented territorial policies in different countries. That is why in many well-developed economies industry-linked clusters represent a conventional form of a business community arrangement. As representative examples a number of clusters could be used such as automotive (Germany (North-Rhine Westphalia), chemical (Singapore; Russia (Perm Region), biotechnological (Sweden), food products (USA (Arizona), telecommunications (Italy; Finland (Helsinki); aerospace (Russia (Moscow Region); film production (USA (Hollywood), IT & computer engineering (USA (Silicon Valley). Clusterization processes are also widely present in operation of mid- and small-size businesses (manufacturing of furniture, footwear, food products), innovation sector (biochemical technologies, telecommunications), heavy duty production (automotive industry), motor racing.

Concentration or association to form a cluster establishes the lead for the involved firms over the peers which operate without using cluster-related development mechanisms. This allows the firms running inside the clusters to have more opportunities in terms of financial and logistical support of their business operations, involvement of experienced and highly-qualified human resources, and effective exchange of information. Clusterization helps the involved companies focus on specific business activities, whilst transferring other activities to their co-participants. At the same time, all concerned parties gain advantages from the co-operation. Such advantages may be displayed in higher product outputs, more effective utilization of all kinds of resources, and so forth. Of special note is availability of wider opportunities in terms of getting access to various innovations. In the modern economic life, the level of development of which to a great extent is determined by functioning of science-driven industry sectors, a competitive advantage, which a particular company has gained, will manifest itself, before anything else, through availability of an access to fresh ideas. Industry-related knowledge and know-how are accumulated and extended through the businesses running in the innovation sector. Cluster membership allows the companies to obtain first-hand information about achievements in science and technology, and/or any changes in customer preferences. If you wish to achieve better results by reducing

costs you have to be located closer to educational institutions of different levels, to suppliers of raw materials and consumables, to potential end users of your products, to customers, R&D centers etc.

2. Problem Definition

Implementation of the clustered regional economy development project calls for setting up a relevant *innovative infrastructure* as well as cross-coupling of science, production, and financial establishments and institutions. One of the areas relating to setting up the innovative infrastructure is expansion of territorial-production parks of science, R&D, and research-and-production types (hi-tech parks, business incubator zones, technology transfer centers, innovation and technology centers, innovation and industry complexes etc.).

It is worth noting that Russia has accumulated sufficient experience in setting up the above mentioned innovative infrastructural elements. For instance, in one of the regions alone, in particular, the Republic of Tatarstan, by date a number of innovative structural elements have been formed and put into operation, such as the Technopark «IDEA», the Special Economic Zone of industrial production type «ALABUGA», the Technopolis «KHIMGRAD», the Association «Nizhnekamsk Industrial District», the Industrial Park Kamskiye Polyany, the Territorial Standalone Innovation Center «Innopolis Kazan», the Kamsky Innovation Territorial-Production Cluster, and so on.

Formation of a petrochemical cluster in the Republic of Tatarstan is a matter of priority, according to the adopted concept of cluster-oriented economic development of the region. Therefore, setting up and development of clustered formations in one of the municipal units of the Republic of Tatarstan, i.e. Nizhnekamsk Municipal District, operation of which served as a pattern for approbation of the approaches worked out by the authors of this paper, is a good perspective in terms of improvement of competitive capacity of the area and boosting the innovative processes.

3. Methodology and Study Findings

Nizhnekamsk Municipal District is the largest center accommodating the petrochemical industry not only of the Republic of Tatarstan but of the Russian Federation as a whole. Nizhnekamsk industrial center accounts for 23 % of overall commercial output of the Republic of Tatarstan, and 30% of regional exports. Nizhnekamsk area encompasses 18% of the fixed production assets of the Republic of Tatarstan, which represent the main domestic industry sectors.

The core industrial business units operating in Nizhnekamsk are represented by the large enterprises involving science-driven technologies, i.e. oil refining and petrochemistry. The Nizhnekamsk city-forming enterprises, in particular, are Nizhnekamskneftekhim Open Joint-Stock Company, Nizhnekamskshina Open Joint-Stock Company, TAIF-NK Public Stock Company, TANECO Open Joint-Stock Company.

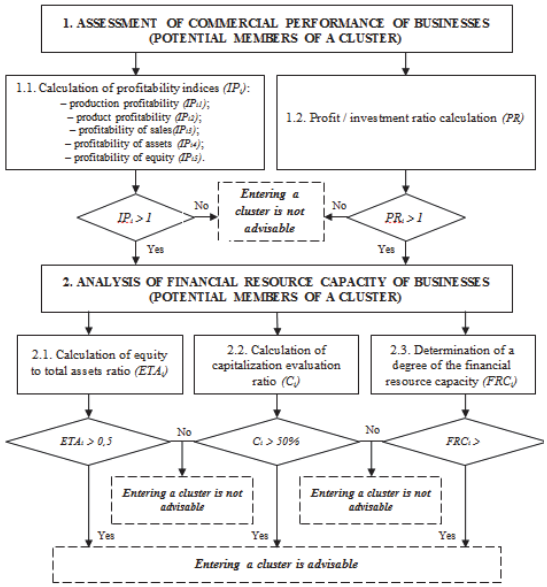


Fig. 1. Clusterization effectiveness assessment algorithm

Figure 1 shows the algorithm developed by the authors of this paper in order to assess clusterization effectiveness. Table 1 summarizes the results of evaluation of advisability of entering a cluster embracing the above mentioned enterprises operating in Nizhnekamsk Municipal District.

Table 1: Clusterization advisability criteria

Potential members of the cluster	Criteria								
	IP_{i1}	IP_{i2}	IP_{i3}	IP_{i4}	IP_{i5}	PR_i	ETA_i	C_i	FRC_i
Nizhnekamskneftekhim Open Joint-Stock Company	1,298	1,097	1,097	1,335	1,457	2,286	0,505	50,492	0,0003
Nizhnekamskshina Open Joint-Stock Company	-6,129	-6,477	-5,917	-5,636	-2,135	-1,217	0,175	2,417	0,0002
TAIF-NK Public Stock Company	0,669	0,913	0,921	0,648	0,605	1,752	0,432	19,292	0,0002
TANECO Open Joint-Stock Company	0,782	0,287	0,292	0,241	-2,629	0,299	-0,025	27,799	0,0001

A review of the calculation results brings us to the conclusion that the estimated values of profitability indices (production, products, sales, assets and equity) exceed the factor of 1 only for Nizhnekamskneftekhim. The profitability indices calculated for TAIF-NK and TANECO are lower than the specified values, while the indices for Nizhnekamskshina are negative. The profit / investment ratio calculated on the basis of the accounting income of Nizhnekamskneftekhim is equal to 2,286, which is almost 1,5 times higher of the profit / investment ratio derived from the data received from TAIF-NK (1,752). The calculated profit / investment ratios as well as profitability indices of TANECO and Nizhnekamskshina are lower than the recommended normative values. This means that Nizhnekamskneftekhim is the most commercially effective business entity that should become the key (anchor) member of the petrochemical cluster to be formed in Nizhnekamsk Municipal District.

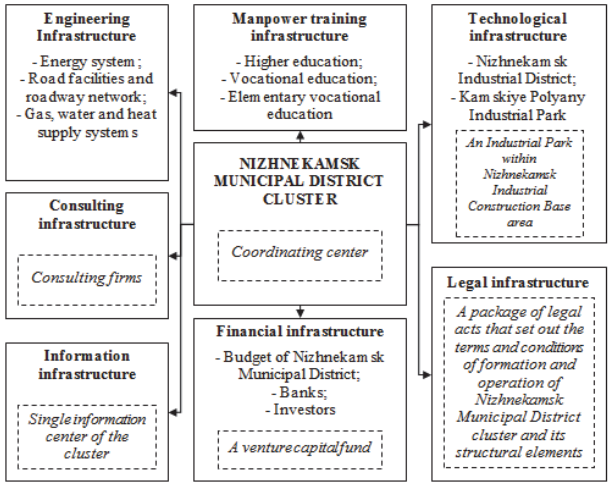
Analysis of the financial resource capacity shows that Nizhnekamskneftekhim demonstrates the highest equity / total assets ratio (> 0,5). The highest degree of intangible assets capacity also pertains to Nizhnekamskneftekhim (0,0003). The capitalization evaluation ratio of integrated business entities, which is equal to an aggregate cost of fixed assets plus circulating assets, amounted to RUB 188172378 thous., where the most part (50,92%) is formed by the capital of Nizhnekamskneftekhim. This fact again confirms the advisability of setting up the petrochemical cluster in Nizhnekamsk area resting on the Nizhnekamskneftekhim enterprise.

Both for TAIF-NK and TANECO integration makes no sense since the indices of their commercial performance and financial resource capacity are rather low. For Nizhnekamskshina entering the petrochemical cluster would be reasonable only from the point of view of improving its performance and getting out of the red.

For effective functioning any cluster, apart from a number of key member-firms exporting their commodities or services outside of the region (in this case – Nizhnekamskneftekhim), should include a network of intraregional vendors to provide the key member-firms with raw materials, OEM components as well as various services, including logistical support, and business climate infrastructure (an access to high quality human resources, capital markets, a taxation system, administrative barriers, transport infrastructure, availability of R&D institutes and centers). Figure 2 shows the structure of a petrochemical cluster as suggested by the authors of this paper.

For building up an infrastructural support for development of the territorial cluster of Nizhnekamsk Municipal District, apart from availability of specific factors (prerequisites), a number of infrastructural elements should be developed (or formed, if not existing). Based on the analysis of main infrastructural elements a structural and functional model can be built up to simulate economic growth of the region. Such a model could allow looking upon the innovative development infrastructure as a set of mutually reinforcing elements.

Interconnection between the infrastructural elements appear to become effective if and unless all resources are pulled together in order to address global problems, or for the purpose of training and further professional development of personnel in case of exchange of skills, or for combining mutually reinforcing stages within a single work package.



[1]Highlighted by a dotted line are the elements which are necessary to be set up for successful operation of clusters within the territory of Nizhnekamsk Municipal District.

Fig. 2. Structure of the petrochemical cluster[1]

Setting up *a coordination center* for harmonization of all elements of the infrastructure would allow creating a mechanism where all components would be supported by each other while interfacing with managerial bodies. Besides, a coordination center could help avoiding possible cases of lack of coordination between the infrastructural elements of the Nizhnekamsk Municipal District cluster.

4. Conclusion

The clusterization process within the territory of the region is impossible to run without development of its innovation system as well as infrastructural elements that make part of such innovation system. Creating any missing elements as well as development of available elements of the infrastructural support for development of territorial clusters allow creating new job places for the local population, increase tax payments into the budget, produce new products along with increasing both quality and quantity of produce, replace imported commodities by domestic products owing to application of knowledge-based, resource-saving and environmentally friendly technologies, noticeably enhance the role of science, education, R&D, design and engineering organizations, academic and higher school, enhance both the level of R&D and efficiency of their implementation.

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