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# Rethinking the Role of Universities in the Development of Clusters

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**ABSTRACT**

The purpose of the study is to examine the roles of universities in the development of the regional economy, namely in the formation of clusters, as well as to analyze the changes in these roles depending on various reasons. The authors used the methods of induction, analysis, synthesis, comparison, and document analysis. The study is based on the triple helix model, which assumes the interaction of the university, industry and public authorities. The conceptual framework has been applied to the analysis of the activities of one of the Russian universities. The final section presents factors explaining the transformation of the role played by higher education institutions in regional development. The results of the study show the conditions on which university participation in the development of regional clusters depends and how it can provide a basis for the sustainable functioning of the universities themselves.

***Keywords:*** cluster; triple helix model; Astrakhan State University; regional system; knowledge capitalization; generative role

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## INTRODUCTION

The role of universities has changed dramatically over the last 20 years. Having previously focused mainly on teaching and research within a universal community of knowledge-creating institutions, universities today assume an additional function due to the processes of globalisation, reaction to the massive increase in the number of students, changes in the forms of organisation of science, etc. [1]. This, in fact, additional role is recursive as well as transformational, reorienting universities into the main institutional spheres participating in economic regulation along with state structures [2]. And although there are numerous studies in foreign [3–5] and Russian literature [6–8] devoted to the role of universities in the development of clusters (more often —-innovative[1] [9, p. 20]) or innovation systems, the conceptual framework for analysing the role of universities in different regional conditions in both Russian and international practice is poorly presented. This article is devoted to the study of this problem, as well as the cause-and-effect relations of its occurrence. Astrakhan State University named after V.N. Tatishchev (ASU named after Tatishchev) is considered as an example and a case study.

## APPROACHES TO THE ROLE OF UNIVERSITIES IN CLUSTER DEVELOPMENT

One of the first to attempt to explore how the role of universities is changing to meet the demands of society both economically and culturally was C. Kerr, having introduced the term "multiversity" [10]. K. Gunasekara [11] draws attention to the fact that works devoted to the study of the contribution of higher education organisations to the development of the territories where they are located, most often either investigate "what" universities do or "why" they do it, and, in his opinion, the literature answering the first question is presented quite widely, but, nevertheless, this issue is not studied deeply enough. S.V. Matyukin and A.B. Frolova note that universities may be interested in interaction with other participants of the region's clusters for such reasons as the inflow of knowledge in leading scientific developments, financial revenues for research activities and stimulation of entrepreneurial activity of their employees [7]. The importance of universities as providers of fundamental scientific knowledge and research results has been recognised by scientists for several decades already [12, 13].

Along with these, the authors of scientific works pay attention to such roles of universities in clusters as training and retraining of personnel [8], providing manufacturing companies with innovation and engineering infrastructure [14], providing consulting services and creating a small innovative enterprises zone [6].

Even neoclassical economic theory explained the production efficiency and competitive advantage of firms expressed in the relative endowment of resources [15]. In this approach, institutions involved in knowledge creation were considered as exogenous factors for the production system [16].

Regarding the significance of university activities for regional development, there are two dominant conceptualisation approaches (models), the 'triple helix' and the 'third mission', which emphasise that universities are becoming increasingly connected to their location.

The triple helix model focuses on the role of universities in multiplying resources

[1] Innovative territorial cluster, along with other features, is characterised by the presence of a scientific and production chain based on international scientific, technical and production cooperation, which implies that this type of clusters is based on a serious scientific and educational complex with the active involvement of universities as important centres of knowledge generation.

and accumulating capital in joint projects through an interactive process — an approach to innovation as recursive interaction and negotiation between the university, representatives of regional industry and government, which make up the three parts of the helix [17, p. 14]. The key point proposed by this model is the hybrid, inter-institutional nature of the relationship between them.

The spheres of state, university and industry were formerly separate entities that interacted across clearly defined boundaries based on their functions. Over time, however, individuals and organisations within the helix have increasingly taken on roles other than those traditionally assigned to them [2].

Thus, the academic entrepreneurship highlighted in this model, focused on knowledge capitalisation and other equity projects, can be seen as a generative role for universities, driving the development of the helix itself.

The second line of research ("third mission") [18–20] proclaims as the main role of universities their broader representation in various areas of life in the region, dictated by "meeting" the multiple needs of a wide group of regional consumers (local community), requiring the search for new forms of management and resources to meet them [21]. The universities fulfilling the third mission become a driving force of social, economic, and cultural development of the regions in which they operate by transferring knowledge and technologies to industry and society as a whole [22].

This model differs from the "triple helix" by emphasising the adaptive responses of universities that build a stronger regional focus into their teaching and research missions. It should be noted that some authors, for example, P. Larendo [23], R. Pineiro, P.V. Langa, A. Pausits [24]), are of the opinion that the term "third mission" as applied to universities is still rather ambiguous and there is no universal concept that would describe what functions can be included in it. Some researchers interpret it based on the 'quadruple helix' model (e.g., E.G. Karayannis, D.F.J. Campbell [25]), in which universities cooperate with industry, government and civil society to create social transformations in order to materialise sustainable development in a particular place (the model of the so-called "social" clusters). This approach does not avoid the formation of hybrid forms of cooperation with industry and public authorities, but rather requires a broader focus aimed at the development of the region as a whole, involving the application of various mechanisms of university interaction with "its" region, i.e., the use of its resource base (human resources and knowledge), which plays a major role in building regional networks and institutional capacity.

## TRANSFORMATION OF THE UNIVERSITY ROLE IN THE DEVELOPMENT OF REGIONAL CLUSTERS: THE EXPERIENCE OF ASU NAMED AFTER V.N. TATISHCHEV

Further, we will offer possible explanations for the variability of the roles that universities fulfil in the development of regional systems, taking ASU named after Tatishchev as an example. The study is based on a detailed review of documents related to the strategic development of the region, its clusters, and the university itself (including annual reports on the results of self-inspection in different periods).

It should be reminded that the founder of the cluster concept, which is based on co-operation between the state, business, and public institutions, in its classical understanding is considered to be Harvard Business School professor M. Porter. Later, its effectiveness in the development of the regional economy was proved by many other studies.

The main interest in cluster policy in Russia began to develop in the 2000s, and the first

documents prescribing and regulating the development of clusters in our country were the Concept of long-term socio-economic development of the Russian Federation from 17.11.2008 No. 1662-r and Methodological Recommendations for the implementation of cluster policy in the subjects of the Russian Federation,[2] which define in detail the goals and objectives of cluster policy, the main directions of support for the development of clusters, as well as mechanisms of financial, organisational, methodological consulting and other support.

At that time ASU named after Tatishchev (formerly Astrakhan State University)[3] and its staff in the context of active research of this approach to the development of regional economy formed a training programme and conducted a series of courses for representatives of public authorities on competitiveness and cluster policy. Therefore, when in 2012 another competition was announced for the establishment and functioning of cluster development centres in the regions of the Russian Federation (specialised organisations created for the purpose of implementing cluster policy in the region, belonging to the infrastructure for supporting small and medium-sized enterprises, one of the founders of which is a territorial entity of the Russian Federation), Astrakhan region was among the winners, and Astrakhan State University, taking into account the existing experience,[4] has become the main institution of higher education in the region providing support to the cluster development centre for the implementation of educational initiatives (master classes, workshops) for employees of business structures, conducting foresight sessions for representatives of potential clusters in the region, analysis of competitive advantages of clusters, identification of obstacles to their development and development of priority action programmes for their elimination.

The aim of such events was to create an attractive image of the future of cluster at the intersection of market trends and industry potential. The foresight session allowed participants to find a vector for improving their business within the cluster and integrating into the general direction, leading to additional benefits by identifying new development opportunities; to master modern technologies for managing companies and organisations on the basis of the cluster approach; to form a new vision of the strategy for the development of activities within the network interaction.

As a result of the active work of the Astrakhan region cluster development centre and ASU named after Tatishchev, three clusters were identified — shipbuilding, aquaculture and fishery, and tourism (later an IT-cluster will also be formed in the region), and support was provided in forming a strategic direction for their development.

These efforts were in line with the agenda for the implementation of the cluster policy defined by the regional public authorities in the Strategy for socio-economic development of the Astrakhan region from 2010 to 2020. The innovation

[2] Order of the Government of the Russian Federation of 17.11.2008 No. 1662-r (ed. 28.09.2018) "On the Concept of long-term socio-economic development of the Russian Federation for the period until 2020" (together with "Concept of long-term socio-economic development of the Russian Federation for the period until 2020"). URL: https://www.consultant.ru/document/cons_doc_LAW_82134/?ysclid=limwbpw5vy532191024; Methodological Recommendations on the implementation of cluster policy in the constituent entities of the Russian Federation. (Ministry of Economic Development of the Russian Federation dated 26.12.2008 No. 20615-AK/D 19). URL: https:// www.consultant.ru/document/cons_doc_LAW_113283.

[3] ASU named after V.N. Tatishchev is located in the Southern Federal District of the Russian Federation and is the economic and cultural centre of the Caspian Sea. The region is dominated by agro-industrial and shipbuilding production, tourism, oil and gas complex and transport and logistics services.

[4] In 2010–2011, ASU became an institutional member of the Global Competitiveness Institute (TCI), and also became part of the affiliated structures of Harvard Business School for the implementation of M. Porter's course "Microeconomics of Competitiveness".

scenario contained in the document was based on large-scale technological modernisation, corporate and trade restructuring of markets, formation of new sectors of the regional economy, increasing the competitiveness of the Astrakhan region in the South of Russia and the Caspian macro-region, including through the "completion" of industrial territorial clusters, and the long-term goal of the regional policy was the development of competitive, innovation-oriented clusters in the economy.[5]

In addition to fulfilling the above described role of ASU in the development of clusters in the region, the university became a direct participant in each of them. Within the framework of the tourism cluster the university implemented the following activities:

- development and improvement of training programmes for tourism specialists in the areas of "Tourism" and "Hospitality" (in close cooperation with travel agencies and tour operators of the region) with maximum approximation of these documents to the needs of employers and the specifics inherent in this type of business (the cluster includes fishing, cultural and cognitive, business tourism, etc.);
- involvement of business in training students in relevant specialities (through seminars, trainings, round tables with representatives of the tourism sector);
- organising professional development courses for service personnel of hotels, inns, resorts, etc., including through the involvement of external experts.

Within the framework of the aquaculture and fishery cluster, the university acted as one of the partners in training personnel for the cluster and conducting research in the field of biotechnology and bioengineering in close cooperation with representatives of the private sector and manufacturers of end products. The main infrastructure for carrying out research work was both individual laboratories of the university and the specialised Technology park of ASU, on the basis of which small innovative enterprises created with the support of the Foundation for Assistance to Small Innovative Enterprises under the "UMNIK" (Smart Alec) and "START" programmes operated.[6]

Astrakhan State University was attracted to the shipbuilding cluster in order to solve personnel problems and increase the level of innovation and manufacturability of enterprises — the university carried out active research work in the field of development of new technologies of structural materials, as well as training of profile specialists.

Thus, the main roles of the university within the framework of interaction in the triple helix were as follows:

- Capitalisation of knowledge focused on the needs of key cluster companies through research and development activities.
- Integration of education and activities within the framework of knowledge capitalisation, in particular the formation of small innovative enterprises through the ASU Technology park.
- Development of training and professional development programmes to support and develop cluster companies.
- The role of a driver of regional innovation strategy, an "analyser" of strengths and weaknesses, combining the efforts of industry and government to develop an innovative scenario of economic development.
- Building and strengthening interconnections between the region's universities, industrial enterprises, and public authorities, including capitalisation of the former's knowledge (generative role).

[5] Resolution of the Government of the Astrakhan region of 24.02.2010 No. 54-P "On Approval of the Strategy of socio-economic development of the Astrakhan region until 2020". URL: https://base.garant.ru/9129040/

[6] Foundation for Assistance to Small Innovative Enterprises in Science and Technology. URL: https://fasie.ru/

• Providing information support for cluster policy through the publication and replication of scientific and applied research conducted by university staff in the field of cluster research and development in scientific journals, local press, ASU website and newsletters.

The analysis of the development strategy of Astrakhan State University has shown that from 2021 to 2030 its main strategic guidelines were and will be:

1) increasing the level of environmental safety and preservation of natural systems of the region;

2) development of marine robotic technologies in the Caspian region;

3) Caspian incubator of agro-biotechnologies;

4) digital platform of the North-South transport corridor;

5) development of a system of societal (integrated) security of the Caspian macro-region.

The change in the strategic goal of the university with a time horizon up to 2030, consisting in the formation of the university as the core of an innovative scientific and educational cluster, resource, and expert-analytical centre of the Caspian macro-region, has defined new thematic areas of research and laid the foundation for the ASU development programme for the next 10 years, based on three elements[7]:

1. ASU is a region-forming university, occupying a special, central place in the regional socio-economic system.

2. A university with a unique infrastructure at the level of the best world standards, using educational, scientific, technical and innovation potential of partners, developing new solutions to ensure socio-economic growth of the region.

3. ASU as a platform for prospecting activities oriented to promote the diversification of the Astrakhan region economy through the creation of new technological industries, region-forming clusters and ensuring the security of the geostrategic border area.

The change in the course defining the university's interaction with the external environment, as well as the key priorities of the university related to regional issues, was, firstly, dictated by the general national policy in the sphere of higher education, aimed at the formation of progressive universities in Russia — centres of scientific, technological and socio-economic development of the country within the "Priority 2030" Programme,[8] which will make it possible to concentrate the resources of Russian higher education institutions on achieving the national development goals of the Russian Federation and ensure a high degree of participation of higher education organisations in the socio-economic development of the country's territorial entities.

Secondly, it should be noted that the period from 2010 to 2020 was marked by the general popularity and demand for a new form of economic development of the territorial entities of the Russian Federation (based on the triple helix model), which, among other things, could qualify for subsidies for this activity.[9] Thus, 27 pilot innovative territorial clusters received funding on a competitive basis in 2013–2015 (RUB 5 billion); RUB 1 billion was allocated to 34 cluster development centres in 2010–2016 for support; since 2016, 12 innovative clusters — world leaders — have been supported; subsidies to industrial clusters from 2016 to 2022 amounted to RUB 3.4 billion, and from 1 January 2023 this practice was

[7] Development Programme of Astrakhan State University until 2030. URL: https://prioritet2030.asu.edu.ru/

[8] "Priority 2030". Official website of the programme. URL: https://priority2030.ru

[9] Law of the Astrakhan Region of 25.12.2020 № 115/2020-OL "On the Strategy of socio-economic development of the Astrakhan region for the period until 2035". URL: https://docs.cntd.ru/document/571051911

continued for those that produced import-substituting commodities.

However, since clusters in the Astrakhan region (compared to other clusters in the country) do not have sufficient potential to qualify for the above forms of support, the focus, in our opinion, has gradually shifted to other priorities for the development of the territory, which is indirectly confirmed by a comparative analysis of the number of references to the words "cluster" and "cluster-based" in the main programme documents of the region. Thus, the Strategy of socio-economic development of the Astrakhan region until 2020[10] mentions the word "cluster", "cluster-based" in 156 cases and has a separate section "Cluster Policy of the Astrakhan region", while in the current Regional Development Strategy (until 2035)[11] these words are used only 41 times, including within the phrase "cluster development centre" (not directly related to measures to improve clusters).

Thirdly, the development of clusters (and cluster policy) in the region, including the role of Astrakhan State University in this process, is affected by internal factors of their participants. For example, the analysis of the situation in the shipbuilding cluster created in the region in 2012 (which was confirmed by the relevant agreement) allowed us to draw the following conclusions. At that time, it included both shipbuilding and ship repair enterprises of the region and educational institutions, including the university in question, as well as the Ministry of Economic Development as a representative of state authorities. In 2018, the bankruptcy of JSC Shipyard "Krasnye Barrikady", one of the key participants of the cluster core, occurred, which had a significant impact on the functioning of the latter, including in terms of such important characteristics of the cluster agglomeration as cooperation, increased interaction, and trust. This event was accompanied by changes in the regional leadership (the governor of the Astrakhan region was changed twice), in the cluster development centre (several managers were appointed), in the ASU leadership, as well as by the relocation of key university faculty members involved in the development of the cluster concept to other territories. These changes could also affect the development of forms of co-operation, the vision of cluster development in the region and related projects, interaction of different partners. As a result, despite the fact that the cluster was already formed earlier, the Strategy of socio-economic development of the Astrakhan region from 2020 to 2035 still includes the task of its creation and development in relation to the shipbuilding cluster.[12]

It should be emphasised that the choice of transport and logistics and agro-industrial technology development as important priorities for the scientific and educational development of the university, although conditioned by the prerequisites lying in the Southern Federal District or even having the scale of the national level, at the same time also fits into the logic of regional development, where these industrial complexes are designated as promising for the formation of clusters.

Thus, as the analysis has shown, there are a number of institutional, political and economic factors shaping the role of universities in the development of regional clusters. The university (Astrakhan State University as an example) in different years focused on adapting its traditional roles — teaching and research —

[10] Resolution of the Government of the Astrakhan region of 24.02.2010 No. 54-R "On Approval of the Strategy of socio-economic development of the Astrakhan region until 2020". URL: https://base.garant.ru/9129040/

[11] Law of the Astrakhan region of 25.12.2020 № 115/2020-OL "On the Strategy of socio-economic development of the Astrakhan region for the period until 2035". URL: https://docs.cntd.ru/document/571051911

[12] See above.

to support regional and national needs rather than changing its role to stimulate industry and government bodies to develop relations towards capitalising its knowledge based on academic entrepreneurship.

However, if at the first stage of its participation in the "state-business-education/research" trinity the university developed its generative role (the university management considered it as a key factor in the future economic development of the region) and served as an important operator in the process of implementation of cluster policy in the region, then at the second stage, most likely, it focused on the local community and on the problem of regional economic growth without a noticeable link to the cluster form of co-operation and the concept of "cluster".

The factors that ensured the university's active participation in the development of the region's economy according to the triple helix model are as follows:

- traditions [as a university professing (cultivating) innovative approaches to the development of science and education, including through the adaptation of the best foreign experience and co-operation with leading universities of the world (ASU has agreements with universities from about 30 countries)];
- relations and scientific and educational networks (with Harvard Business School and directly with the founder of the cluster concept, Professor M. Porter, within the framework of studying the results of his research on the development of regional clusters, educational technology for teaching courses related to the development of competitiveness of the territory, including through the cluster approach; with the Institute of Competitiveness, which studies successful experience in the implementation of cluster policy in all countries of the world);
- close connection with regional authorities at the first stages of cluster policy formation in the region, where ASU was entrusted with an active role in identifying regional clusters through foresight sessions, interviewing potential cluster participants, etc.;
- availability of innovation potential and relevant infrastructure for research and development of products and technologies relevant for cluster participants.

It could be assumed that such a strong position of the university in the region is dictated by its historical heritage — a serious research base formed over decades (the university has existed since 1932), and, as a consequence, its connection with industry. At the same time, the analysis of the sectoral affiliation of universities in the region showed that there are four state universities in the territory of the Astrakhan region, which are under the authority of four different ministries: Health, Culture, Industry and Trade, and Science and Higher Education. At the same time, ASU became a classical university only in the early 2000s. Before that, it was a pedagogical university (formerly an institute). Thus, in less than a decade the university was able to create a powerful educational system with various training areas. In its turn, its role in the formation and development of the region's human capital further positively influenced its research activities.

At present, in our opinion, along with the above-mentioned factors indicating the potential of Astrakhan State University to develop clusters, this is hindered in the region by the following factors:

- low understanding by the representatives of small and medium-sized businesses of the benefits of innovation;
- weak demand for academic entrepreneurship among large companies that have their own resources for research and development;
- negative migration processes leading to the outflow of qualified personnel;

• lack of incentives for regional participation in competitive selection for subsidies;

• difficult geopolitical situation, which complicates practical benchmarking in the field of cluster policy;

• limitation of the research role of the university in the development of clusters in the region due to its reorientation to the interests of the national level in order to obtain funding (due to the lack of funding in the immediate regional environment of the university).

Thus, there are numerous explanations for the variability of the roles fulfilled by universities across the region. The limited ability of Astrakhan companies (members of the clusters) to fund joint research and the industry specificity of some of them, which implies poor use of technological innovations, has led to the fact that the university has to develop cooperation with companies and other organisations outside its region. On the other hand, the strong ties that the university has built with the local community and the non-profit sector over a long period of time have mitigated this need, transforming, and shaping a new perspective on the position (mission) that ASU currently occupies in the region. This line of development is supported by the university's focus on regional engagement, which is consistent with the position regarding the academic role of higher education institutions reflected in the literature that emphasises the historical significance and cultural factors that shape this role.

## CONCLUSIONS

This article analyses the roles of universities in the development of regional systems.

In the course of the study, the authors, firstly, found that the management of Astrakhan State University named after Tatishchev modified the positioning and basic behaviour of the institution to better meet regional needs. Moreover, at the first stage the university has effectively partially took over the functions of the state, playing an important role in the identification and formation of clusters (the very blurring of boundaries between functions in the triple helix model), but at the second stage the focus shifted to the fulfilment of the third mission, which consists in a broader contribution to social development (which is also evident in the recent initiatives of the university and a number of research projects). These changes were due to social and political factors of regional significance, trends in science and education determined by federal authorities; peculiarities of the management's vision of priorities in management activities, etc.

Secondly, the study showed that, despite the fact that the university showed entrepreneurial initiatives (creation of SIEs — small innovative enterprises) and played a key role in regional management, the commercial benefits of the university within the cluster concept, especially at the second stage, were poorly realised (historically, Astrakhan State Technical University had a greater connection with the industrial sector of the region, specialising in the fishing industry and training specialists in shipbuilding and ship repair, i.e., in the sectors that are leading for the cluster). At the same time, the pursuit of more entrepreneurial activities associated with the implementation of strategic projects under the "Priority 2030" programme (the application for which was supported) may increase the sustainability and status of ASU.

In some respects, the research suggests that the choice between the importance of academic entrepreneurship and adaptive behaviour in relation to business needs may be a moot point. However, the self-capitalisation of knowledge within a region (or beyond its borders), arrangements for co-capitalisation with cluster members or with companies outside them — these and other issues may well be of increasing interest. They may also include

the question of how university participation in regional development can provide a basis for the sustainable functioning of universities themselves.

Although the paper used actual data related to the Astrakhan region, the scope of the systematic approach proposed in this paper is broader and it can be applied to analyse the contribution of other universities to regional development. In this regard, there are certain prerequisites for broadening the basis of the study and turning it into an interregional one.

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