

**CDSSES 2020****IV International Scientific Conference "Competitiveness and the development of socio-economic systems" dedicated to the memory of Alexander Tatarkin****INNOVATION MANAGEMENT IN THE REGION-FOREIGN PRACTICE**

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**Abstract**

This article presents a study of one of the successful regional innovative development cases – the state of North Carolina (USA). This example is quite impressive for the successful creation of an innovation infrastructure that contributes to the dense communication of the innovation process's primary agents on a separate territory. The purpose of the article is to identify the potential and adaptation opportunities in Russia's regions that provide effective technology transfer to the real economy in the state of North Carolina. The article's research object is a research cluster consisting of several universities and a Technology Park, called the "Research triangle of North Carolina" because its creation was a defining moment in the development of the region. Applying in this work such research methods as analysis, comparison, modeling, the following conclusions are obtained: 1) the prerequisites for creating a Research Triangle are formed; 2) the institutional design of the innovation system in the region is presented at present; 3) the necessary factors for the successful development of such research centers are highlighted. These aspects of the problem are particularly important for analyzing the US experience's potential application in Russia.

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## 1. Introduction

People's ability to generate effective solutions aimed at the development of the economic system is largely determined by the existing institutions in a particular society. An extensive literature is devoted to the study of the influence of existing institutions to the economy (Acemoglu & Robinson, 2016; Pilyasov, 2012; Shestakovich, 2019) in which the authors explain the success of the country's development in scientific and technological development through historically established institutions in society. The concept of "institution" in this study will be understood as a rule or system of rules, beliefs, norms, and organizations that together generate regularity of (social) behaviour (Zulkarnay, 2018).

In this study we illustrate the "triple helix theory". The three elements of this helix are science and education, business, and the country's leadership. The cooperation of these three components provides a synergistic effect which gives scientific and technical development of the whole institutional system (Itskovits, 2011). The hypothesis of this study is that the process of development of the innovative economy in the region is based on the effective interaction of formal and informal institutions within the framework of the "triple helix" model. A successful example that fully fits into the "triple helix" theory is the research Triangle Technology Park in North Carolina. In its 60 years of operation, this "meta-Technopark" has placed North Carolina among the country's leaders on many economic indicators (employment, unemployment, cost of living, exports, etc.), transforming the lagging "tobacco state" into a centre of innovation. How the state government managed to achieve a high level of development of competitive high-tech export-oriented industries, and what institutions and institutional mechanisms contributed to this process are issues that will be discussed in the proposed article.

## 2. Problem Statement

According to the strategy of scientific and technological development of the Russian Federation (hereinafter - RF), approved by presidential decree of December 1, 2016 No. 641 one of the directions of the state policy is creation of favourable conditions for research, development and implementation of effective transfer of product innovation in the real economy. This indicates that in Russia, there is an understanding of the need for changes aimed at forming a system of close interaction between representatives of science and business, but measures aimed at achieving such interaction do not give the proper result. According to various estimates in Russia, about half of the entire industry belongs to the fourth technological order, 5% - to the fifth and about 1% - to the sixth. It is worth noting that in developed countries, the share of industries of the fifth and sixth orders is much higher (Marichev, 2019). According to the Global innovation index – (GII) - an aggregated indicator that illustrates the level of innovation development in the country, Russia ranks 46th with an index of 37, 6, among 129 countries. For comparison, the United States ranks 3rd with an index of 61.7, China-14th with an index of 54.8. There are various explanations for this lag scientific and technological progress in Russia, among which is the presence of the "Dutch disease" in the domestic economy, the presence of unfavourable informal institutions (Zulkarnay, 2018), the imbalance and autonomous existence of regional innovation systems, the imperfection of formal institutions of authority. In this regard, we can say that research of institutions

that determine to innovative development of a region is quite relevant at present. The results obtained in this article can be used in further research to identify the possibilities of transplantation of North Carolina institutes in the regions of Russia.

### **3. Research Questions**

The main issues to be addressed in this study are the following:

- Identification of the main prerequisites for the creation of a Triangle technology Park on the territory of the state of North Carolina.
- Research the interaction system of public administration institutions (organizations) with their inherent "rules" and functions of control, coordination, and innovation motivation. Determining the main factors for the successful development of such research centers.

### **4. Purpose of the Study**

The purpose of the study is to provide an analytical review of the institutions included in the innovation management system in the state of North Carolina (USA), in order to identify the potential and opportunities for their adaptation in Russia.

### **5. Research Methods**

The following methods were used during the work:

- "Analysis and synthesis" of scientific literature, periodicals about the history of the state of North Carolina, research Triangle technology Park, which allowed us to identify the main prerequisites for innovative development of the region, identify non-random dependencies and determine their causes and consequences, as well as to formulate the main factors necessary for the creation of such a Technopark in a region.
- "Comparison" - the method is used to formulate the main hypothesis and conclusions of the study.

"Modeling" - the method is used to build a model of interaction between the main subjects of the regional innovation system in the state of North Carolina.

### **6. Findings**

The history of the innovation cluster began in 1952 when Howard Odum (sociologist and founder of the Institute of social science research at the University of North Carolina) proposed a number of ideas for creating a research centre that combines the capacity of three local research universities and businesses, which activities would be aimed at the development of high-tech industries in the state (Cummings, 2017).

In the mid-50s, Romeo Guest, the head of a construction company, began to actively attract industrial companies to the state from other regions. Guest, who was a graduate of MIT, had an idea of science-based Economics based on the example of Highway 128 in Massachusetts. Based on the Boston

experience, he coined the term "Research Triangle", noting the corresponding location of universities in the cities of Chapel Hill, Durham and Rolet. The basic concept of the Research Triangle was formulated as follows:

- 1) creating a favourable business environment that helps to attract large successful companies from other states to North Carolina;
- 2) creation of scientific laboratories and research centres on the territory of the Research Triangle;
- 3) interaction of universities and companies (local flow of knowledge, in order to expand and deepen research);
- 4) stimulating economic growth by developing innovative industries (Choi & Markham, 2019).

One of the main prerequisites for creating an innovation cluster in the state is the presence of universities with their comparative advantages in the form of 2 medical schools, 2 engineering schools and a core of outstanding researchers in almost every field of science. All three universities were located near the main airport and railway stations, which made this area attractive for potential residents to stay here. In addition, it should be noted that the idea of the Research Triangle was born after the Second world war, when many businessmen began to understand that scientific research is the engine of industrial growth (Nassar et al., 2019). New industries were being created, which required highly qualified specialists and new technologies. The research Park concept was soon presented to the state's Governor, Luther Hodges. Despite initial doubts, after a short period of time, the Governor supported the idea and became involved in the process of promoting it (Morgan, 2010). The main prerequisites for creation are shown in table 1.

**Table 1.** Prerequisites for creating a Research triangle

Prerequisites	Description
The initiative of individuals	Howard Odum (sociologist and founder Of the Institute for social science research at the University of North Carolina) (science representative) Romeo Guest, head of a construction company (business representative), State Treasurer Brandon Hodges and Walter Harper of the state conservation and development Board brought industry to the state from other regions. Representatives of local businesses were interested in creating a scientific cluster as a new source of income, and government officials understood the need to develop the state as a whole.
The stagnation of the economy	At the time of the Triangle's creation (late 50s), the entire US economy was in a state of stagnation. There was a need for scientific and technological development, the source of which is the generation of innovations, which in turn is successfully implemented within a certain space that unites business, the state, and universities.

Government's "brain drain" perplexity: the government partially finances the production of educational services (universities) in order to internalize the externalities of education services in the state, and the externalities are partially seen in other US States.

Low level of development of the state economy

Low quality of life

Availability of scientific schools of national and world levels

Good initial location of the main components of the Triangle-near transport arteries

The demand for innovation from business

Many young professionals preferred to leave the "unpromising" state in a search for a better life (reduced tax revenues, lack of demand from the local market for an innovation-oriented workforce).

- agricultural orientation of the region;

- high unemployment rate;

- low level of sectoral diversification of the economy.

One of the lowest per capita income indicators in the country

2 medical schools, 2 engineering schools and a core of outstanding researchers in almost every field of science.

All three universities (North Carolina state University, Duke University, and the University of North Carolina at Chapel Hill) were located near the main airport and train stations, which made the potential placement of residents in the Technopark even more attractive.

Business realized that scientific research was the engine of industrial growth. New industries were being created, which required highly qualified specialists and new technologies.

The initial idea was that at the first stage, the state provided only administrative support, and all financial support should be shared between companies and universities. However, the authorities soon came to understanding that in order to attract large businesses to the region, appropriate infrastructure is needed and began to actively promote the creation of infrastructure through the purchase of land necessary for the Technopark, the implementation of partial funding for education (grants, discounts for training), tax breaks. During the entire existence of the scientific cluster, about seven institutional units were created in order to effectively interact with the subjects of the innovation system (government, universities, business). However, the main governing body is The Commission on science and technology, which includes the Governor, the Minister of Commerce, representatives of universities, and representatives of industry on an equal basis, their main function is to identify priority areas of science and industry in the region. Within the framework of such interaction, each of the subjects has the motivation to invest Finance, knowledge, and manage efficiently. State authorities are interested in economic growth through the creation of new jobs, tax revenues, and growth of the gross regional product. Business entities are interested in the emergence of new competitive innovative products, which is possible thanks to joint research and development with universities. Universities, in turn, received sufficient funding from both the state and business to conduct research and maintain a high level of material and technical base (McCorkl, 2012).

A major role in the formation of the Triangle was played by local communities supporting, organizing, and managing science, technology, and innovation (Figure 1). In 1978, the North Carolina alternative energy Association was established. Its task is to analyze relevant technology projects, lobby

for laws, and interact with state authorities. It consists of scientists, businesspeople and politicians who are engaged in the development of the idea of clean energy (Link, 1995).

3) In 1980, the Department of science and technology of the Ministry of Commerce (responsible for innovation policy) was established, the first result of which was the opening of the microelectronics Center in the same year. The center started creating research and educational network programs, which in the 90s (after technology improvements) was completed in the form of an "information highway"-a network that unites all research centers, enterprises and educational institutions of the Triangle and allows for rapid exchange and transfer of data between them. In 1984, the Department of science and technology initiated the creation of a center for biotechnology. Its goal is to stimulate research and business in this scientific field (mentoring support for scientists and entrepreneurs, attracting foreign investors) (De Arteché, 2018).

4) In 1984, a technology and small business development Center was established on the territory of the Triangle. Its original function is to advise on the organization of innovative business activities. Today, it is a public-private Association, subordinated to the state, engaged in expert assessments of business, provides assistance in processing applications for grants and applications for participation in various tenders (Menzel et al., 2017).

5) The Triangle business incubator program was developed in 1983 to support and develop new businesses established in the Technopark. For 13 years, it has evolved into an Association of business incubators – its activity is to supervise and support startups (Morgan, 2010).

6) In 1993, the Technology Association was established, which included the largest representatives of business in the state. The Association resolves issues of supporting key research areas, creating jobs, and lobbying for tax incentives (Link, 1995).

7) In 2009, the last organization that combines all the elements of the "triple helix" was created the Council for innovation. It includes: the Governor, 2 representatives of the upper and lower houses of the legislative Assembly, the Minister of Commerce, 3 members of the Commission on science and technology, business representatives, representatives of higher and secondary educational institutions. The Council is engaged in solving the most urgent problems related to the innovative and scientific and technical development of the region (Feldman & Low, 2018).

For several decades, the institutional and organizational structure of the Research Triangle has been built, which currently has the following form (Figure 1)

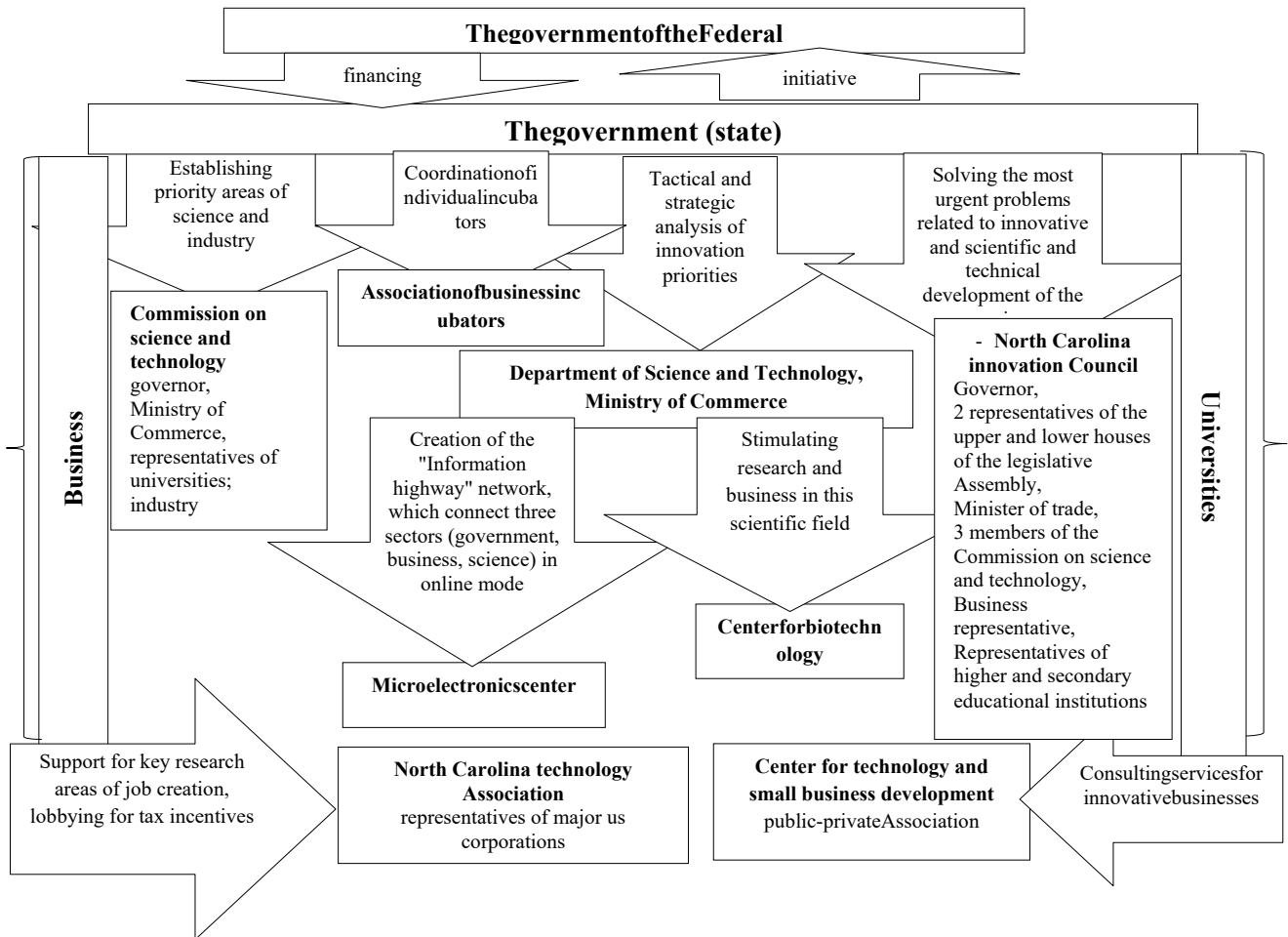


Figure 1. Institutional design of the research triangle

## 7. Conclusion

Thus, summing up the research, we can conclude that in order to create and successfully develop a cluster like the Research Triangle, it is necessary to meet a number of factors presented in table 2, among which an informal institution is important, which is reflected in a high level of social responsibility.

Table 2. Necessary factors for the successful development of the North Carolina Research triangle

Factor	Description
Human factor	The Research Triangle has created a localized market of highly qualified personnel who are potential carriers of new ideas and knowledge.
Organizational and legal form	The status of a <u>non-profit organization</u> eliminated the binding of the Research Triangle's activities to personal interests, and elicited a positive response from the state, private investors, and the public. In addition, the lack of competition between individual entities has encouraged close collaboration between business, government, and educational institutions to strengthen North Carolina's economic and scientific development.
The profiling state for prospective industries	At the initial stage, the following promising areas were identified: pharmaceuticals, electronics and chemistry, which is explained by the specifics of the region.

High-quality administration	<p>At all stages of the Research triangle's activity organizational structures were created aimed at high-quality interaction of subjects of innovative activity, namely representatives of government, business and science. (Commission on science and technology; Department of science and technology of the Ministry of Commerce; Center for technology and small business development; Association of business incubators; Technology Association; innovation Council).</p>
A certain role of the state	<p>- creation of the Research Triangle infrastructure, which in turn allows to increase the technological and economic potential, as well as to carry out the necessary reforms and transformations without losing efficiency and reducing economic indicators;                  - partial funding of education and science (discounts for students, grants for research);                  - tax benefits for business representatives.</p>
Geographical factor	<p>The space within which the coordination of the main agents of the innovation process (companies and universities) is established, thereby reducing transaction costs associated with the search for information, forming an area of knowledge concentration and as a result achieving a low time lag between the development of innovation and its commercial implementation.</p>
An informal institution with a high level of social responsibility	<p>The contribution of specific individuals who have a high level of social responsibility has become key factor in determining the success of the entire project.</p>

The crucial element of the Research Triangle's success was the institutions factor. The correct formal institutional structure of innovative entrepreneurship determined the success of the Technopark and contributed to the formation and development of effective informal rules among the project participants. Building a productive regional innovation system has become possible due to the presence of incentives and motives for each of the subjects in active interaction with each other.

The most important point is that the state leadership was able to identify and implement the main priority areas of innovation policy that meet the needs of the time, as well as to focus efforts and attention on individual industrial sectors that meet global trends, the development of which determined the intensive type of economic growth in the region.

Also, one of the features of the management structure of scientific and technological development in the state of North Carolina is the active participation in the management process of scientific organizations and universities. Their involvement in the development and implementation of innovation policy confirms the establishment of close interaction between science, government and business. The state determines the main vectors of science development, and science in turn responds to the requests of the state and the real sector of the economy. To generalize, it should be noted that the state administration of North Carolina has developed clear priorities, effectively distributed powers, and eliminated duplication of functions.

Thus, the country has a high level of public authorities' reputation, particularly determined by stable organizational and financial support for scientific and technological development. This allows potential innovative investors to implement long-term planning horizons. The study of the established institutional structure for managing technological development in this region over the years clearly shows that it is necessary to observe continuity in the formation of formal institutions for its greatest effectiveness.



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