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TÍTULO: Temas de gestión claves en redes egocéntricas como Modelo de Gestión de Integración "Ciencia-Educación-Negocio": revisión de la literatura.

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RESUMEN: El artículo presenta la revisión bibliográfica sobre temas de gestión claves en redes egocéntricas de complejidad integradora "ciencia-educación-negocio". Las redes egocéntricas se consideran como un modelo basado en un principio de red heterárquico, y los resultados de la investigación muestran que el gobierno, en los niveles federal y regional, trata de lograr un papel central protagónico en el complejo integrador "ciencia-educación-negocio". La coordinación regional es la experiencia más exitosa, dado a que las autoridades regionales logran conectar y coordinar las acciones de otros actores. Al mismo tiempo, la integración se desarrolla a nivel de redes egocéntricas con un centro protagónico constante, sin alcanzar el nivel de redes policéntricas.

PALABRAS CLAVES: integración, ciencia-educación-negocio, red egocéntrica, red policéntrica, auto-organización.

TITLE: Key management's subjects in egocentric networks as the management model of the integration "Science-Education-Business": review of literature.

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ABSTRACT: The article presents the literature review about key management's subjects in egocentric networks of integrative complex "science-education-business". Egocentric networks are considered as the model based on a network-heterarchical principle. Results of investigation show that government on the federal and regional levels tries to achieve pronounced central role in integrative complex "science-education-business". Regional coordination is the most successful experience; regional authorities manage to connect and coordinate the actions of other actors. At the same time, integration develops at the level of egocentric networks with a pronounced constant center, not reaching the level of polycentric networks.

KEY WORDS: integration, science-education-business, egocentric network, polycentric network, self-organization.

INTRODUCTION.

In modern management processes, two major types of organizational and management models are developed: power-hierarchical and network-heterarchical (Minina, Basov, Demidova, 2012, Stark, 2001, Usiaeva, A. et al. 2016). We assume that there is the existence of third type, market-hierarchical, but it serves as the mechanism of self-organization. The use of such typing, organizational and management model, allow you to determine which of them reflect the specifics

and trends in social and economic development, and the functions of formation of integrative systems "science-education-business".

Powerful hierarchical models of organization and management are wide-spread, despite numerous attempts to analyze them as absolutely degrading management structures. The main arguments of rejection from power-hierarchical models are the following:

- bureaucratic centralism,
- administrative and directive methods of management,
- conservativeness,
- inertia,
- formalism in management,
- missing of mechanism of changing of the organizational model,
- insufficient flexibility and susceptibility to changes (Abchuk, Vasilenko, Volkovitskaya and others, 2011; Agapova, Belousov, Vinokurova and others, 2011; Borisov, Pruel, Minina and others, 2014; Akhrenov, 2017; Galimardanov, 2009; Leavitt, 2005; Follett y Graham, 1995; Vasilieva, Rubtcova, 2015).

Power-hierarchical models have characteristics which have some inertia and support stability of the system (Volchkova, & Pavenkova, 2002). Because of in conditions of economic stability and the production of mass goods powerful-hierarchical models of organization and management are viable. At the same time, the dynamic scientific and technological process led to the emergence of innovation-based economy and market volatility. It weakened the position of power-hierarchical models (Stewart, 2007).

This transformation significantly affects power-hierarchical integrative model of management of complexes "science-education-business" in Russia. The maximum centralization of management of integrative complex "science-education-industry" was achieved in the USSR, when the state model

of government was dominated. The experience of the Soviet Union is the subject of intense interest, but generally characterized as inconsistent with modern economic system now (Kitov, Kuznetsova, 2005, Rubvalter, 2009, Saltykov, Kiseleva, Dezhina, 2009, Sanina, 2010).

Market transformation of the economy led to emergence of special model of state "order" of integrative processes in science, education and business. According to this model, the state was considered as the initiator and the main engine of integration (Rubtcova, Pavenkov, 2016). It has provided funding the integrative process. The rest of subjects were forced to connect to it, because it was needed to complete government order (Strongin, Maksimov, 2005).

However, the transition to the market system did not influence on changes in the organizational and managerial models of functioning of integrative systems (Minina, Basov, Demidova, 2012; Pavenkov, Shmelev, Rubtcova, 2016; Pavenkov, O., Pavenkov, V., Rubtcova, M. A, 2015a; Pavenkov, O., Pavenkov, V., Rubtcova, M. A, 2015b. Soviet model of management of integration "science-education-business" was replaced by functionally similar control system in which the organization of integration process was the task of the state and was under government control (Demidova, Ivanov, Popova and others, 2008, Demidova, Minina, 2004, Kitov, Kuznetsova, 2005).

The effectiveness of the model was low, because combination of market and powerfullyhierarchical regulation's methods have led to the formation of numerous informal practices of interactions. On the one hand, these practices were able to support collapsing communication between organizations of science, education and business. On the other, it has led to the formation of informal and sometimes corrupted institutions of budget allocation (Demidova, Ivanov, Popova and others, 2008). In this regard, we can conclude that the traditional power-hierarchical models of management of integrative complexes in modern conditions, when focus is made on the innovation economy, are ineffective (Shudegov, 2006). Both, the model of direct government management and the model of state "order" for the integration are not able to accumulate and direct of interests of other subjects - organizations of science, education and business. Efforts of subordinated subjects directed on creation of good relations with power-hierarchical structures. Horizontal ties, which are needed for integration, don't develop (Rubvalter, 2009).

DEVELOPMENT.

Since year 2000, gradual transformation of mechanism of state "order" into public-private partnerships in Russia has been started. Organizations of science, education and business interested in integration, are considered as co-clients and co-financial structuries. In fact, this transition includes refusal from the development of heterarchical network structures and from dominance of vertical hierarchical models of management and the development of network-heterarchic models.

Network-heterarchic models.

According to the network approach, objects of analysis are interconnections, their structure, and the place of the agent in these relationships. Network, where it is possible to find a single center, was called egocentric. Network, where it is possible to find several centers, was called polycentric (Oleynik, 2004).

Among network heterarchic models, there are management models based on egocentric network and management models based on polycentric networks. We will focus on the first models.

One of the main egocentric network's characteristics is the centrality. The centrality is feature of the location of subject in connection with other (Rubtsova, 2016). The central subject in network can be considered as the network, which is connected with the largest number of other subjects

(centrality as the central communicative saturation). Central network may be the subject controlling the number of streams *(centrality as mediation)* (Rasskazov et al, 2016).

Integration of network structures includes the relations of exchange and resources diversification. It means that subject who has significant social capital has more power in the integrative complex.

A subject possessing more power in the network structure is central (*centrality as the big amount of* power). Subject, who has more amount of power, does not violate the general heterarchical principle, that is, other subjects have power, rooted in the possibility of implementation of different principles of evaluation (Gashkov, Rubtsova, 2017).

Integrative complex, which built on the basis of egocentric network, contains of the core and the periphery, which is the network of relations for the remaining subjects with weak bonds. Egocentric networks can be constructed around one of the central management subjects: State *(federal and regional level)*, research University, innovative commercial organizations.

The state as the central subject of management integrative complex "science-educationbusiness" in the egocentric network.

The state does not enter into integrative complex "science-education-business" directly; however, its role in the system of network heterarchic management is significant (Sergeyev, Alekseenkova, 2007). Key management models which focus on the state as a central subject of the egocentric network is connected with the concept of public-private partnership. However, role of government, science, education and the business community in it may be different.

Public-Private Partnerships (PPP) is considered as the institutional interaction between the state and other subjects of social and economic life, in order to implement scientific and technological projects (Khardina, 2007). The concept of public-private partnership is the attempt to mitigate of the models of direct state control (see e.g. Rubtsova, 2007, 2011, Rubtsova & Vasilieva, 2016). The state tries to direct science, education and business on priorities. Unfortunately, the level of development of private partnerships in Russia falls behind the foreign countries.

Choice of one of the models depends on concrete priority sector. In the management of integrative complex science-education-business' greatest emphasis is stressed on the concession model, which is the mechanism of involvement of business in the projects with high risks (Lundvall, 1996, Nelson, 1993).

Public-private partnership in Russia is considered as one of the ways of activation of the private initiative on the new markets. This is the domestic market of high technologies. From theoretical point of view, complete privatization of science and education's spheres would lead to the risk transfer to private sector. However, in a modern economy, such privatization is not possible (Gerrard, 2001).

Management model with using of public-private partnership becomes the mechanism of correction of the structural and financial defects of functioning of "Science-Education-Business"' integrative complex. However, the main problem is the choice of partnership's tools. Using of these tools is based on investor interest in the sciences and techniques as the source of long-term profitable company (Gordeev, Kiselev, 2008). Russian system of management of integrative scientific innovative complex is substantially decentralized (see. Fig. 1) (Rubvalter, 2009).

Figure 1. The organizational model of management of scientific and innovative complex of



Russian Federation [23, p.28].

Given organizational model was initially focused on the development and use of tools of publicprivate partnership. But this model is the model of transition. In the structure of mechanism of management of the integrative complex "science-education-business", public-private partnership is not considered as the permanent form of management (Gordeev, Kiselev, 2008). Publicprivate partnership with the dominance of government, must be changed by other forms of organization of functioning of integrative complex "science-education-business".

Regional and local level of power as the central subjects of management of the integrative complex "science-education-business" in the egocentric network.

Regional and local levels of government are included in the management of integrative complex "Science-Education-Business" with the help of system of regional-private partnership (regional model of public-private partnership).

The region's tasks in the field of Public-Private Partnership consist of:

- 4 development of programs of innovation development, events, projects based on regional material and financial resources, and material and financial resources of subjects of integrative systems "science-education-business",
- creation of organization with mixed ownership. Regional government has some part of property in these organizations. Projects and programs of creation of knowledge-intensive industries, scientific and technological infrastructure implemented in these organizations,
- participation as a party to an agreement with the subjects of integrative systems "scienceeducation-business", making for the implementation of infrastructural, innovation and education projects,

consideration of projects of integrative complexes "science-education-business" to solve problems of regional importance, making suggestions for co-financing of these projects (Lyubalin, 2009).

The natural "connection" of the innovation infrastructure (the network of technological parks, innovation and technology centers as the structures of higher educational institutions, scientific and other organizations) with the regional level has been supplemented by the active participation of the region in innovation policy, the creation of territorial tech parks and business incubators of small innovative companies developing innovations of regional significance. Some regions of the Russian Federation on this basis achieved significant success. As an example, tech park "Idea" (Kazan), the region as the subject of management is actively involved in the creation of the tech park "Ingria" (St. Petersburg) (Pravitel'stvo Tatarstana, 2017). Thus, the egocentric network of integrative complex "science-education-business" can be built on base on the region at the meso-level. It will be more effectively than in the system with a central role of the government. This model of management of integrative complex is considered as one of the perspective.

Science universities as central subjects of management "science-education-business" integrative complex in egocentric networks.

According to the idea of Science University, the egocentric network of integrative complex "science-education-business" should be created around the university as a creator of innovative scientific technologies and giver of human resources.



Figure 2. The university as the center for integrative complex "Science-Education-Business"

(Phanickina, 2007, p.16).

The peculiarities of the research scientific university are the following:

- the implementation of the high degree of integration of science, education and the business community, which allows you to make knowledge with the effective transfer of technology in the economy,
- the involvement of the lectures and students in research activities is required, the wide range of basic and applied research,
- integration of educational programs on different levels, the right to teach according to own programs and standards (standard of higher education, postgraduate, doctorate), the presence of highly effective system of masters training and highly qualified personnel, developed system of retraining programs,

international high evaluation of scientific and educational activities, which is considered on many indicators, including «the influx» of graduate students and teachers from other countries and regions, preparation and defense of theses in foreign languages, etc. The work in the university, the graduate person of the university as the lecturer, is considered as a uniquely negative factor (Akhrenov, 2017, Gordeev, 2008, Ivanec, 2009).

Contribution of research university in the development of industry is caused by the creation of special innovation infrastructure for development of innovative firms - tech parks and business incubators. The "innovative belt" of small innovative companies and start-ups is needed for normal existing of research university. A research university is effective if it can activate the work of research and innovation network along with other forms and models: classical universities, federal and specialized institutions (Gordeev, 2008). The requirements to the research university show that it really should be the center of the egocentric network of integrative complex "science-education-business".

The doctrine of research universities in the Russian Federation, expressed in the Government Decree from 13 July 2009, No 550, "About the competitive selection of programs of the development of universities", which was named "national research university", was immediately faced with number of critical ideas. The first critical idea was connected with doubts that research universities will focus on the preparation of those professionals who are able only to use technologies. However, they will not create new technologies, that is, the commercialization will spoil fundamental science. Certain critical questions have arisen because the idea of a research university was spread on humanitarian universities and institutes. Despite the fact, that these doubts have been rejected, the interest in the concept of a research university in the environment, especially technical universities, Russia should be noted.

One of the most urgent issues of development of national research universities in Russia was the question of the university's autonomy. The autonomy of universities in Russia is limited. Thus, the national research universities in Russia are not sufficiently developed centers of egocentric networks. There is the positive experience of leading technical universities in organization of tripartite interaction "science-education-business". However, socio-economic sciences and humanitarian sciences aren't sufficient involved in this interaction.

Innovative commercial organization as the central subject of management integrative complex "science-education-business" in egocentric network.

According to this model of organization of egocentric network, the center is an innovative commercial organization (see Figure 3).





complex "Science-Education-Business".

Innovative firm is considered as the main source of commercialized high-tech technology. Modern innovative economy is based on the use, distribution and transformation of these technologies. However, according to this approach, it is needed to develop clear criteria of the innovation commercial organization. According to legislative schedule to the St. Petersburg Government's Decree from 22.07.2008 N $_{2}$ 878, "About changes in St. Petersburg Government Decree from 20.07.2007 N $_{2}$ 881" – "Methods of rating of organizations to innovative type" (2016) innovative organization should be qualified to the quantitative and qualitative criteria of innovation (Zhelvitsky, 2014).

The main problem of this approach is broad approach to innovation. Innovations are considered as the products or services which are perceived as a new on the market. In the economic practice of Western countries, "innovation is interpreted as the transformation of the potential scientific and technological progress in the real, embodied in new products and technologies" (Fiveyskiy, 2009). In the BRICS countries, particularly in China, innovation is interpreted in a broader context. Innovation can be "well-forgotten old thing", perceived as "new", and the product of copy of Western technologies (Fiveyskiy, 2009).

A broad interpretation of innovative direction of companies does not allow to select a company organizing egocentric network of integrative complex "science-education-business", because simple reinterpretation of Western or forgotten technology does not require a "connection" with scientific organizations, creating new knowledge, and universities providing training of student, who can apply this knowledge into real economic life.

It is necessary to formulate the following criteria of innovative companies, as the parts of the egocentric network of integrative complex "Science-Education-Business":

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• high-tech's focus,

- skilled team,
- clarity of vision of the target audience,
- marketability of the product on the national and international markets,
- patents on the product or know-how (see e.g. Rubtcova & Vasilieva, 2016).

In Russia, there are the significant numbers of such companies. These companies are often foreign or divisions of foreign companies («Hewlett Packard», «Motorola», etc). For example, «Hewlett Packard» actively cooperates with the St. Petersburg State University. In June 2009, year Educational and Scientific Center of HP was opened in St. Petersburg State University on basement of project of International Institute of Technology «Hewlett Packard». The goal of the center is not only effective training of students through the concrete theoretical and practical work, but also achievement of the world-class scientific results (St. Petersburg State University's students engaged in science, 2015). Given experience shows that great innovative companies can organize egocentric networks of integrative complex "science-education-business".

CONCLUSIONS.

Thus, we can make conclusions on the base of investigation of the problems of the formation of the central subjects of egocentric networks in integrative complex "Science-Education-Business" in Russia. Russian state, at the federal and regional levels, plays the central role in the process of integration of complex "Science-Education-Business".

Regional coordination is the most successful experience. Region authority is able to connect and coordinate the actions of the other actors. At the same time, the integration is developing on the level of egocentric networks with permanent center. Integration cannot reach the level of polycentric networks. One of the perspective of investigation of the role of subject in

polycentric networks is using of modern Russian personology (Petrovskiy, 2007, Petrovskiy, Starovoytenko, 2012, Petrovskiy, 2013, Starovoytenko, 2015, Shmelev, 2015) as the theoretical basement for further research of the process of integration of complex "Science-Education-Business" in Russia.

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