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INNOVATIVE ASPECTS OF PRODUCTION ORGANIZATION ON THE LEVEL OF THE LOCAL PRODUCTION SYSTEMS: WORLD EXPERIENCE¹

In recent years in the world of regional development much attention is paid to the functioning of the local production systems (LPS). This was particularly relevant in the context of the global economic crisis, when the survival of the regions at different levels of development and the extent depends on the capabilities of their self-development, good governance and providing a variety of public and private institutions.

Local production systems are widely understood – it can be regions of different types and rank, including municipalities, industrial centers and industrial nodes, territorial-production clusters, free economic zones, a variety of innovative combinations, regions of new development, etc. [1]. In spite of this broad definition of LPS they should have a number of essential characteristics, of which the main ones are the economic viability of the territory (especially the presence of the economic potential, the necessary and sufficient for self-development), manageability (the presence of the subject for management of given territory) and institutional factors (the presence of the institutional mechanisms underlying decision-making on the area and providing, in particular, the training of qualified personnel, conducting research and innovation, tax, financial, organizational and other support for development).

Among the variety of forms of LPS important place belongs to this, which allow to strengthen innovation and investment sector of the regional economy, providing greater competitiveness of its industries. Among these LPSs are primarily technoparks and technopolises.

In Russia, which recognized the need to move on the path of building an innovative economy, there is much interest to foreign experience of the implementation of technoparks and technopolises, the main purpose of which, in our opinion, is the foreknowledge and advance of various innovations.

High-technology branches have high rate of scientific and technical progress. The rate of new inventions and entirely new areas of research, which sometimes become independent branches of scientific knowledge, increases the rate of obsolescence of existing equipment and

technology. Following devaluation of permanent capital causes a significant increase in costs and falling competitiveness. Therefore, manufacturers have high interest to the scientific knowledge, they are interested in contacts with science. In addition, high technologies do not constitute a separate and isolated clusters. In many cases they are connected and enrich each other. But for their complex using fundamental research, opening new fields of application of new processes, principles and ideas are necessary.

Over the last 25 – 30 years, developed countries have gained considerable experience of innovation. There were various forms of the introduction of scientific developments in production, among which of particular interest is the organization of production in the formation of industrial parks and technopolises. Technopark is agglomeration of high-tech firms, grouped around a large university, institute, laboratory. The main objective of the park is reducing the time of introduction of scientific ideas into practice. Parks have special infrastructure (buildings, constructions, telecommunications), which along with certain tax benefits is available to new firms. Technopolis are scientific-industrial towns, placed near a major industrial center, based on a tight integration of the scientific base and a diversified production structure. The idea of building technopolises originated from Japan in the early 80s.

The first university technology park appeared in 1947 in the United States in Boston. Ten-year experience of its work, and of other parks, appeared after it, was so successful that since the seventies of the twentieth century number of industrial parks began to skyrocket.

Despite significant differences in economic conditions in different countries, there is one universal cause of organizing of industrial parks in universities. This reason lies in the fact that for the most favorable conditions for development universities create multi-system funding for their activities. The first principal component of this system is the state (federal) funding for training and research activities. The second component is the completion of the budget by performing

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of university scientific research. The third component is conducting of educational activities on a commercial basis (commercial reception, a variety of educational services). The fourth component is industrial activity of a technical college. Fifth are International Relations, funding for international programs, sponsorship and so on [2].

„Science Park” – a form of integration of science and industry – are classified as regional scientific and industrial complexes. In the development of „science parks” are clearly seen two phases: the 60s when there was a majority of „science parks” in their „homeland” – the U.S. – and there were rudimentary forms of the Western European countries - Britain, France and Germany. In the 80 years since the beginning of which was formed the second generation of „science parks” in the U.S. and Western Europe, „science parks” appeared in countries where there was none before (in Japan and other Asian countries), the variety of „Parks” replenished with new varieties [2]. „Science Park” can be roughly summarized in three models – American (U.S., UK), Japanese, and mixed (France, Germany).

The American model of industrial parks (U.S. and UK) has three types: 1) Scientific and technological parks; 2) „research parks”, differ from the first by that their innovations are developed only to the stage of technical prototype; 3) „incubators” (USA), and innovation centers (in the UK and Western Europe), in which universities „are home to” start-up companies by providing them with a relatively modest rents the land, accommodation, access to laboratory equipment and services.

The largest and the most famous park of the United States is Stanford (Silicon Valley). It is located on the University lands leased for a term of 51 years to high-tech companies, interacting with the university, which have a lot of engineers and researchers as professors. The park was declared a filled in 1981 – 80 companies and 26,000 employees. Among the companies there are three major agencies U.S. Geological Survey, hyper-giants of Electronics (IBM, Hewlett Packard), aerospace company („Lock-Hid”), chemical and biotechnological companies [2]. Since the early 80s in Western Europe has spread a new for these countries form of technology parks, focused on the needs of small high-tech enterprises – innovation centers, similar to American „incubators.” Their mission is to connect ideas and inventions with entrepreneurs and capital, to attract public and private funds to provide „start-up period” for new innovative companies [3]. Functions of innovation centers cover different stages of the innovation process, in particular promoting the transition from an experimental production to commercial development of new products. One do not always require the creation of new companies. Very often innovation centers provide assistance to researchers-entrepreneurs in sale of licenses for the new product to manufacturers. A number of innovation centers are run by local authorities, and the larger belong to the European Network based in Brussels. It brings

together about 40 innovation centers. Linking innovation centers in different countries, the European Network facilitates cross-country technology trade to firms.

„Science parks” of France can serve as an example of a mixed model of „science parks”, focused on the Japanese and the U.S., in particular, the largest of them, „Sophia Antipolis” [3] (located on the Riviera, an area of over 2,000 hectares by the mid-80’s land was sold to companies and research organizations, and the maximum number of employees referred to – about 6000 people).

The Japanese model of „science parks”, a technopolis, in contrast to the parks, involves the construction of entirely new cities, focusing the research in pioneer and advanced science-intensive industries and industrial production. In addition, an important feature of technopolises is that they attach great importance to the construction of social infrastructure, great attention is paid to progressive ideas of urban development, the combination of beautiful architecture with the natural environment, local traditions and everyday comfort.

The project „Technopolis” in Japan was adopted in 1983. The impetus for the formation of the concept of Japanese technopolises were the difficulties that the country was going through after the second energy shock that occurred in 1979. Heavy industry in Japan was in a depressed state, and the traditional policy of the government has not given results. Small businesses, which employed 90% of the labor force, suffered bankruptcy.

New developments in the Japanese economy of the early 80’s. (structural re-building, aimed at eliminating the existing territorial and sectoral imbalances, the transition to intensive economic growth model based on the use of the achievements of NTP, soft tech development, etc.) have forced the government to radically revise many of the strategic direction of its policies and to make a factor of STP key not only to general economic, but also in the regional plans [4].

The basis of each technopolis is the so-called incubator of new technologies (or research center). Technological Incubator in the industry is a technique used by the Government for the establishment of enterprises that have a key influence on the growth of venture capital industries and technology development. In different countries the term „incubator” has several different shades. For example, in the U.S. – it is large firms that help small businesses get on their feet. In Japan these are small firms that are able to quickly develop new projects.

At a certain resemblance to the foreign and national research complexes technopolises differ significantly from them. If, for example, the American technoparks are usually based on one or two technologies and industries technopolises have a broader techno specialization. In the technopolis creation of the rapid development of knowledge-intensive base industries should then give an impulse to progressive growth of the economy of certain regions and the country’s economy as a whole [5]. That

is, from Technopolis the growth impulse should be transferred to a specific area (hinterland) and then to develop the country's economy as a whole. Thus, the technopolis is a form of territorial organization of the economy, which is based on scientific center that acts as the „incubator” for new ideas. These ideas should be picked up later by experienced companies of the belt introduction, which put them into finished products, and develop technology to produce it. Furthermore, this technology is transferred to large industrial enterprises. The advantages of such a connection – at a rapid introduction of scientific achievements in life, and their commercialization (Fig. 1).

In fact, the development of the concept of technopolis in Japan meant the use of the principles of polarized development, but qualitatively different, modern level. Having similar to the previous regional programs target – „discharge” areas of concentrated industry, primarily the Pacific industrial belt, attracting capital and production capacity to the province – the project „Technopolis” fundamentally differs by method of tasks realization [4].

Appointment of Technopolis is to:

1. to adapt the existing industrial structure of regions to a more flexible response to the emergence of technological innovations, ie increase the share of knowledge-based industries, to stimulate the development of scientific and research organizations working in the interests of these industries, encourage the development of educational institutions that train professionals for them;
2. to stimulate socio-economic development in the relatively backward regions through the revitalization of high-tech industries in these regions;
3. to unload the large metropolitan areas (Tokyo and Osaka) by inference beyond them most of the high-tech industries;
4. to assist small and medium-sized companies to enhance their technical capabilities and competitiveness of their products.

The implementation of a technopolises is carried out through the establishment on regional level of close contact between the three parties of the formation of Technopolis: local authorities, local scientific capacity and private capital. The integration of these forces is necessary to carry out a joint policy of complex regional development. Basic requirements for the Technopolis development policy are as follows [5]:

1. The program of development of each technopolis should be part of a unified state program on socio-economic development, ie, provides coordination of the interests of the state and region.
2. A consideration of the latest achievements of science and technology inside industrial production in, ie STP defines a factor of economic growth.
3. Training of specialists should be carried out by a local university or college. That is, technopolis should be hosted in a city, which has at least one university.

Each industrial complex, in turn, should be based on two foundations: a research center and developed infrastructure (fig. 2). Research Center is designed to identify new areas of science and technology (predicted NTP), to develop and introduce new technologies into production, to train highly qualified professionals. The infrastructure should provide the efficient production and research activities. It should ensure the promotion of ideas to finished products and products – to consumers. Emphasis is placed on high-speed means of transport, the advantages of which lie in the fact that the production of high-tech industries, which should be developed in the technopolis is much smaller per unit of value and, accordingly, the share of transportation costs in the cost of production is lower. In addition, high-tech production is not dependent on the bringing up of large masses of raw materials such as heavy industry and chemical industry. At the same time, the speed and in-time delivery of raw materials and finished products is crucial.

The adoption of the concept of technopolis as a basis for regional policy was followed in Japan by the legislative embodiment of this fact, ie, establishing a legal mechanism for regulating the development and implementation of the technopolis project. The law on the technopolis was adopted in Japan in 1983. According to this law for each technopolis a plan should be developed. Preparation of this plan is carried out by local authorities of the region in which it is expected to place a particular technopolis. The plan of technopolis should define: the geographic size of Technopolis (an area reserved for the technopolis should not exceed one thousand hectares), the specific objectives of the industrial complex, based on the use of new technologies, the main indicators of long-term planning of construction and operation of industrial and socio-domestic infrastructure, including means of communication, the financing of private enterprises, which accommodation is necessary for industrial development of the of the region.

Thus, the general requirements for each technopolis are as follows: a low degree of territorial concentration of production and population, the city of a type which could become an industrial center, the presence of at least one higher education institution (university or college), in which the curriculum should include courses to study the development of knowledge-based industries of different specialties, well-developed transportation network, the presence of crossings and airports.

Accordingly, when evaluating each project of technopolis one should analyze the following questions: 1) whether technopolis can be based in the area, and 2) whether the plan of Technopolis corresponds to main areas of national development, and 3) whether a realization of this plan gives the greatest effect on this very area.

Creating a Technopolis covers an extended period of time and place in four stages: the preparatory stage, the creation of basic infrastructure, the development of Technopolis, the commercial stage. State regulation

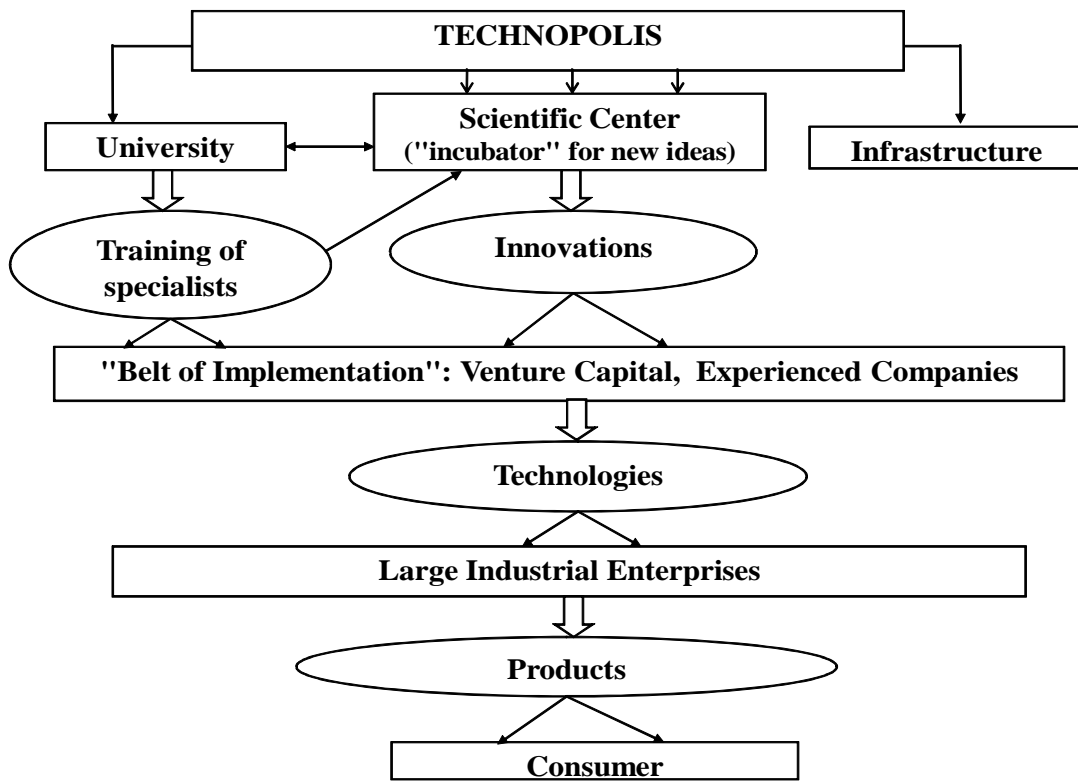


Fig. 1. The Organization of Production in the Technopolis

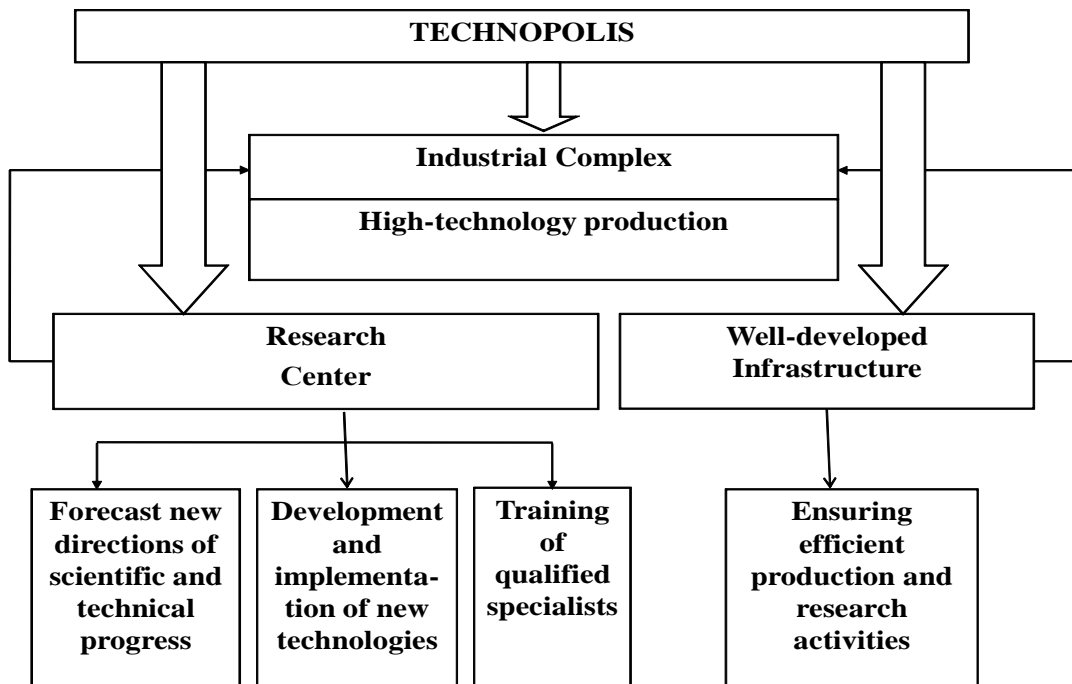


Fig. 2. The General Structure of Technopolis

measures on the establishment of techno can be divided into two groups [6]: the control measures used by federal agencies and the control measures used by regional authorities.

The control measures used by federal agencies include such measures of direct regulation, as: approval of specialization and a technopolis program, financial participation in the creation of technopolis basic infrastructure, funding for national research programs on the development of key high-tech products and technology, special loans to specific scientific and technical projects, which are returned only in the case of commercial success of new technology or product, the placement of government research laboratories in the technopolis, partial funding of basic research at universities and other research organizations of technopolis, financial support for the new priority industries, providing them with special purpose loans; accommodation of government (including military) orders, etc.

Measures of indirect regulation include: the promotion of R & D (ie special tax credits, accelerated depreciation of assets, preferential leasing of public funds, etc), promotion of innovation, namely, a partial exemption from taxation of risky business, education, tax-exempt insurance reserve funds, the provision of subsidies, etc.; free access to the equipment and patents that are in public ownership, the creation of public consultation, information, and other service centers and services, assistance in training and retraining of personnel, provision of an agreement with private banks to provide organizations and enterprises technopolis preferential loans, promotion of integration of researchers and manufacturers in the unions and associations, the conclusion of agreements on joint scientific and technological projects and the various agreements among them, the adoption of temporary exemptions in the legislation (limiting competition law, protection of the domestic market, the new high-tech products, etc.).

The main trend in contemporary politics of state regulation of the processes of creation and functioning of the Technopolis in developed countries is gradual replacing of direct measures (including financial) management by indirect methods, promotion of private investments in the technopolis in reducing the share of public investment.

Japanese economy is also characterized by a tendency to a gradual reduction of government regulation and expansion of local governance by regional authorities. In the planning and construction of technopolises principal role, as it has been already noted, is given to local authorities. For example, prefectures and cities are developing programs to create technopolises and allocate up to two thirds of funds for their construction. This is explained by the fact that on the ground it is know better how and what to do. The Central Authorities should deal with strategic and structural issues, the development of

measures to support R & D system and knowledge-intensive industries in the economy.

The control measures used by regional authorities include such measures of direct regulation, as the development and implementation of a technopolis program, funding the construction of basic infrastructure (including transport and information networks), funding priorities for STP, the key for the region's scientific and technological projects; creation of advisory and financing of regional centers, centers of technical manuals, non-profit organizations to retrain staff.

Indirect regulatory measures that are used by regional authorities, are providing benefits to local taxes, the establishment of low prices on land and real estate for science and technology and industrial companies in the technopolis, the rent of funds hold in the regional property, discounts on electricity used by companies, the allocation of credits and the establishment of tax relief to a priority for the technopolis kinds of scientific, technical and industrial activities, companies in transition to a new specialization, providing low-interest loans to companies located in technopolis, the creation of regional funds for respecialisation assistance, development of priority directions of scientific and industrial activities, venture capital firms, moving of professionals, companies and capital from other areas, ensuring of equal access to the use of common structures technopolis, technical, information, counseling and other assistance to the regional information, advisory and financial centers, centers of technological leadership.

The government finances the project „Technopolis” mostly indirectly. Only about 1.5 billion yen are allocated to technopolises annually from the central budget. At the same time, the „Law of technopolis” provides for the project participants a fairly substantial tax and credit incentives to encourage business and research activities in the Technopolis. Thus, during 5 years from the beginning of the program a system of accelerated depreciation for the high-tech companies was introduced, which allows companies to deduct the first year and 30% of the cost of equipment and 15% of the value of buildings and structures. In addition, the first 5 years in Technopolis a tax on new investment in equipment is reduced by 30% and up to 15% – a tax on buildings and structures. There are also full or partial exemption from tax on capital equipment for research and development. It is permitted to include in the column „loss” of companies the budgets of new legal entities.

Special financial assistance is provided to small and medium-sized firms involved in the program. A corporation, financing small and medium-sized companies, provides them loans on favorable terms – a rate of 2.7% per annum with maturity of 15 years. Moreover, if under normal conditions the loan recipients must form groups of at least 20 companies, in this case this requirement is reduced by half. By estimates of

MITI, the average cost of building a technopolis is about 550 billion yen (\$ 2.4 billion).

Efficient formation of technopolises is impossible without external support, ie without the participation of the state (in particular through the development of the state regional programs). The Japanese realized that Silicon Valley could not have come if there were not the large-scale programs of U.S. Department of Defense and NASA. At the same time limiting the scope of the impact of the economic life of the center to the regions in Japan meant the simultaneous strengthening of its information, coordinating functions.

The concept of creating of technopolises in Japan's regional policy is attempt to recreate the concept of „polarized” development on a higher level corresponding to the era of rapid development of scientific and technological revolution. In general, the idea of technopolises as a regional research and production systems that promote economic development in peripheral regions is certainly rational. Similar complexes with different names have become increasingly widespread in many industrialized countries.

Foreign experience of the formation of industrial parks and technopolises seems to be very useful for Russian conditions [7]. This is particularly important considering the economic crisis and focus on an innovative path of development.

At the same time, creating an innovation economy in Russia, including the development of innovative local production systems, such as technoparks and technopolises, faces a number of difficulties, without overcoming of which the hope for success is problematic. The main difficulties, in our view, should include the following.

1. Highly monopolized market and, consequently, the low level of competition, in which the large companies-monopolists are not interested in innovation. Task of the state – the creation of a competitive environment and incentives for the development and implementation of innovations. It is especially important to create conditions for attracting private investment to innovation sector, as only public funding, not nearly enough. As the world practice in developed countries shows, private investment in innovation is much higher than the state. It seems that the problem stimulate innovation could become an important tool for public-private partnerships.

2. Weak applied science, its significant collapse in the post-Soviet period put constraints on the introduction of innovations in the production and commercialization of innovations. The problem of development and implementation of innovative projects in Russia is not new and is primarily concerned with the existing system of economic management and long-term prediction lag and the lack of proactive. Without the development of a strategy and guarantee business is difficult to navigate in the innovation space.

3. The absence of a coherent long-term national

science and technology policy, the uncertainty of priorities in innovation. Without such a policy and clarity of the perspectives to expect that the business will invest in innovation to occur. Should be defined at the state level strategic directions of scientific and technological development in the light of global trends and national reserve, capabilities and needs. In addition, for the priorities of innovation should be designed system of maximal preferences, including financial, fiscal, technological, social, and others, as well as for its legalization.

4. Not formed a legal environment and the general „rules” to stimulate innovation, security of return on investment, intellectual property protection, the relationship between the investor and the owner of an innovative idea. In foreign practice, these tools are created and operate efficiently, including tax and other incentives to venture capitalists, which stimulates private investments in high technologies.

5. Inflexible tax and financial policies of the state in the field of innovation, not containing instruments of their incentives, including purely symbolic benefits for developers of innovation, lack of tax incentives for private investors and funds, high lending rates for the projects, not included in the cost of R & D costs, etc .

6. The presence of various administrative and other barriers of development and innovation, in particular venture capital business, especially small and, accordingly, the large financial risk for him. High levels of corruption hinders innovation activation at all stages of innovation until the building permit and connecting companies to infrastructure (water supply and sanitation, power grids, etc.).

Thus, it is a necessary to form the mechanism of the state of development and innovation, including the interrelated elements of the economic, legal, institutional and other nature, working to encourage investment in innovation.

Overall attractiveness of technoparks and technopolises for enhancing regional development in Russia is not only the possibility of strengthening investment and innovation sector, the possibility of interaction of science and industry, restructuring the economy in the direction of promoting a transition to the preferential development of high-tech industries and, as a consequence, reduce production costs and improve the competitiveness of industries, but also in raising the general level of socio-economic development and improving the lives of people in their territory.

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Бурматова О. П., Сумська Т. В. Інноваційні аспекти організації виробництва на рівні локальних виробничих систем: зарубіжний досвід

У статті проаналізовано можливості й обмеження впровадження інновацій в управління регіоном на рівні локальних виробничих систем (ЛВС). Подано коротке трактування ЛВС, виділено їх основні ознаки. Наведено огляд формування інноваційних ЛВС в світовій практиці, включаючи США, країни Західної Європи і Японію. Показано специфіку таких форм організації виробництва і науки на території як технопарки і технополіси. Основний акцент зроблено на впровадженні інноваційних принципів економічного розвитку у вирішення регіональних соціально-економічних проблем на прикладі Японії. Наведено аналіз реалізації проекту „Технополіс” в Японії, показана специфіка японської моделі „наукових парків”, званих технополісами, наведено характеристику основних результатів. Показано основні труднощі практичного впровадження і функціонування інноваційних локальних виробничих систем в умовах Росії.

Ключові слова: інноваційна економіка, регіональна політика, локальні виробничі системи, технополіси, технопарки, венчурний бізнес, наукоємкі технології, структурні перетворення економіки.

Бурматова О.П., Сумская Т.В. Инновационные аспекты организации производства на уровне производственных систем: зарубежный опыт

В статье проанализированы возможности и ограничения внедрения инноваций в управление регионом на уровне локальных производственных (ЛПС) систем. Дана краткая трактовка ЛПС и выделены их основные признаки. Приведен обзор формирования инновационных ЛПС в мировой практике, включая США, страны Западной Европы и Японию. Показана специфика таких форм организации производства и науки на территории как технопарки и технополисы. Основной акцент сделан на внедрении инновационных принципов экономического развития в решение региональных социально-экономических проблем на примере Японии. Дан анализ реализации проекта „Технополис” в Японии, показана специфика японской модели „научных парков”, называемых технополисами, приведена характеристика основных результатов. Показаны основные трудности практического внедрения и функционирования инновационных локальных производственных систем в условиях России.

Ключевые слова: инновационная экономика, региональная политика, локальные производственные системы, технополисы, технопарки, венчурный бизнес, наукоёмкие технологии, структурные преобразования экономики.

Burmatova O. P., Sumskaya T. V. Innovate Aspects of Pproduction Organization on the Level of the Local Production Systems: World Experience

The paper is devoted to the problems of possibilities and limitations of innovation in the area is managed at the level of local production (LPS) systems. A brief treatment of LPS is given and their main features are identified. The authors give an overview of formation of innovative LPS in the world, including the U.S., Western Europe and Japan. The specificity of such forms of organization of production and science in the territory as technology parks as technopolises is shown. The main focus is on the implementation of innovative economic development principles to the solution of regional socio-economic problems in the case of Japan. The analysis of the implementation of the Project „Technopolis” in Japan is given, the specificity of the Japanese model of „science parks”, a technopolis, is shown, characteristics of the main results is given. Authors showed the basic practical difficulties in the implementation and operation of innovative local production systems in Russia.

Key words: innovation economy, regional policy, local production systems, technopolises and technoparks, venture capital, high-tech industries, the structural transformation of the economy.

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