ЭКОНОМИКА: ИСТОРИЯ, ТЕОРИЯ, ПРАКТИКА

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G.K. NIYETALINA,[1]
c.e.s., associate professor.
"Turan" University[1]

THE NATIONAL INNOVATION SYSTEM IN KAZAKHSTAN: OPPORTUNITIES OF TRIPLE HELIX

Abstract

The article considers the development of national innovation systems in the context of the triple helix of innovation concept, which implies the union of the state, science and business. The article considers the emergence of the Triple helix model with the justification of the main reasons and its development in the world community. A sufficiently detailed analysis of the main characteristics of the Triple helix model in practice is given. The main role is given to the state in the form of support for Research and Development, the development of science through universities, the commercialization of scientific ideas, including the use of business incubators. It is shown that in Kazakhstan the institutional spheres of the state, science, business are still in a rather fragmented state and effective interaction between them is not built. The article substantiates the use of foreign experience in the development of national innovation systems, in particular, American experience, European experience on the example of Finland, Japanese, Chinese experience (as generally in Southeast Asia). With the use of certain methods of the Triple helix model, it is possible to develop Kazakhstan's innovation system in a proactive way. Science, business and government, in addition to their traditional functions, should be more active in acquiring new functions that are common to other participants in the innovation system.

Key words: innovation, triple helix, state, society, business, technology, commercialization, effectiveness.

Today the main challenge for many economies in the World is the process of building effective national innovation system. The creation of the first such a system has become a huge socio-economic innovation, during realization of which it was made a huge number of trials and missteps. As a result, mankind at the end of the last millennium has successfully set up an interesting experiment on the construction of various innovative systems. Events have developed and continue to develop worldwide, including Finland, the Silicon Valley in the USA, Singapore, Japan and Taiwan in the East Asia. Success in the economy has been achieved everywhere it was possible to understand and apply the laws of creating innovative systems.

For Russia and Kazakhstan, declaring their desire to join the developed national innovation systems, all data on the success and failure stories that occurred during this global experiment are open. At the beginning of the 21st century, building the national innovation system is much simpler, since the pioneers have already presented the world their experience of conquering innovative peaks: however, this construction will be easier only if the world experience accumulated by mankind is taken into account and used.

Undoubtedly, in view of the fact that the uniqueness of each innovation system is adequate to the sociocultural, climatic, geopolitical, resource and other features of countries and regions, there is no exhaustive list of sufficient conditions for ensuring the success. Each country is to find those individual traits that will correspond to the native traditions of communication, management and business.

Modern works on the theory of innovations contain the analysis of properties and new trends that are reflected in the interaction of the state, science and business and taken the form of the concept of a Triple Helix, or a model of strategic innovative networks [1].

The Triple Helix theory was created in England and the Netherlands at the beginning of the 21st century by the professor of the University of Newcastle, Henry Itskowitz and the professor of the University of Amsterdam, Loyet Leidesdorf. The triple spiral symbolizes the union between government, business and the university, which are the key elements of any country's innovation system. The Triple Helix model shows the inclusion of certain institutions in the interaction at each

stage of creating an innovative product. At the initial stage of knowledge generation, the authorities and the university interact, then during the technology transfer the university cooperates with business, and the result is brought to the market jointly by the government and business [2].

The basis of this model is the thesis about the dominant position of the institutional structures responsible for the creation of new knowledge – universities, as well as the importance of the network nature of the interaction of participants in the innovation process within strategic associations where three sets of relationships intersect. The Triple Helix is a horizontal approach in innovation policy, founded and arising as cooperation and the intersection of different institutional areas. At the same time, innovative policy is considered not so much as an initiative "from above" emanating by the government, but as a cumulative result of interaction at various levels (especially at the regional level) of government bodies, representatives of business, universities, academic circles and non-governmental organizations. At the same time, peculiar networks (associations) arise, for example, as a result of cooperation between large and small firms, universities, academic researchers, industrialists and consumers with the participation of the state.

The emergence of the Triple Helix may be associated with the following changes in science, economics and politics. Firstly, there has been a change in the "leading link" in the relationships of participants in the process of creating innovation. The level of uncertainty in the innovation sphere has always been quite high, including all the elements of the "production cycle" of knowledge: costs, results, relations with the environment. The interaction of participants in the innovation process is carried out by trial and error, control is increasingly becoming "reflective", and it includes closed loops of negative feedback between producers, consumers and intermediaries.

Secondly, as a result of the growing dynamism of systems, the need arose for organizing effective forms of interaction between the three development entities (Government, Business, Science) and creating a new basis for building these connections – communication networks. The effectiveness of the network organization of any activity is that its result increases nonlinearly with the growth of the network. Each network node, whether it is a manufacturer or a consumer of products, receives an additional effect from a simple increase in the number of nodes. The presence of a network implies the need for transformation in the innovative development of the functions of the state, universities (scientific organizations) and firms [2].

Thirdly, globalization affects the change in the conditions of innovation activity, which manifests itself in different ways, including through the activities of transnational corporations, supranational unions and alliances. The functions of organization and management of innovative activities, previously performed by the state on the basis of hierarchical structures, vary both in terms of executors and mechanisms. When the economy acquires the features of a knowledge economy, the main changes in its properties are the inclusion of science in the sphere of production interests and incentives for firms, as well as increasing the level of responsibility for innovative development for the state. The role of research universities in the Triple Helix model is undeniable. Most countries today are moving to the knowledge economy, when new knowledge and technologies become a key factor in the competitiveness of the state. It is the universities that conduct research and development that become in this situation the most important resource for high-tech production. If a business is already coming to the understanding that it must adhere to a strategy based on innovation, then power in the "triple helix" is still a weak link. One of the main requirements for power is 3,5–5% of GDP for science and innovation [4]. The state's task is to improve the legislative framework for innovation and create conditions for public-private partnership that is attracting business to collaborate with research universities in the field of creating and introducing new domestic developments and technologies when the state is ready to share the risks and costs of R&D and implementation with business technology.

Analysts have repeatedly noted that in the innovation systems of industrialized countries, the intersection of institutional spheres is ensured between science, which is funded by the state (basic research and a small part of applied), and proprietary science that exists on the means of business (part of applied research and development). This system is also implemented in the form of a huge number of small innovative enterprises, which are also supported by the government (through various grants) and venture capital. Thus, public-private partnerships are being implemented in these countries, the purpose of which is to turn fundamental discoveries into new technologies and products. In general,

today, entrepreneurship is the pivotal basis for the economic growth of all developed countries, which forms more than half of the GDP [5].

From an institutional point of view, in order to build a national innovation system, an absolutely necessary issue is the conformity of the relations of the main participants in innovative development with the principles of the Triple Helix. The Triple Helix model adequately defines and measures the relationship between participants in the innovation system, namely government, business and the university. There is not a single example in the world where a national innovation system operates effectively outside the principles of the triple helix, where universities are not at the centre of these events.

The Triple Helix as an analytical model describes the set of institutional mechanisms and models of policy choice (models of national innovation systems) with an explanation of their dynamics. In the process of transition to post-industrial development, not only the economy is changing, but its interconnections with other sources of social and political development. Previous theories explained the development of the economy on the basis of ideas about the interaction of private capital and the state. The need to include the innovation process in explaining economic dynamics, that is, the constant production of innovations, means a change in relations between the private sector and the state in the same way as between the state and science. In particular, the general trend in developed countries is to achieve a high level of innovation financing by the private sector of the economy. In leading countries, for example, in the USA, the private sector provides up to 75% of research and development expenses, and the 100 largest international corporations account for 90% of this amount [3]. The main features of the Triple helix Model are shown in Figure 1.

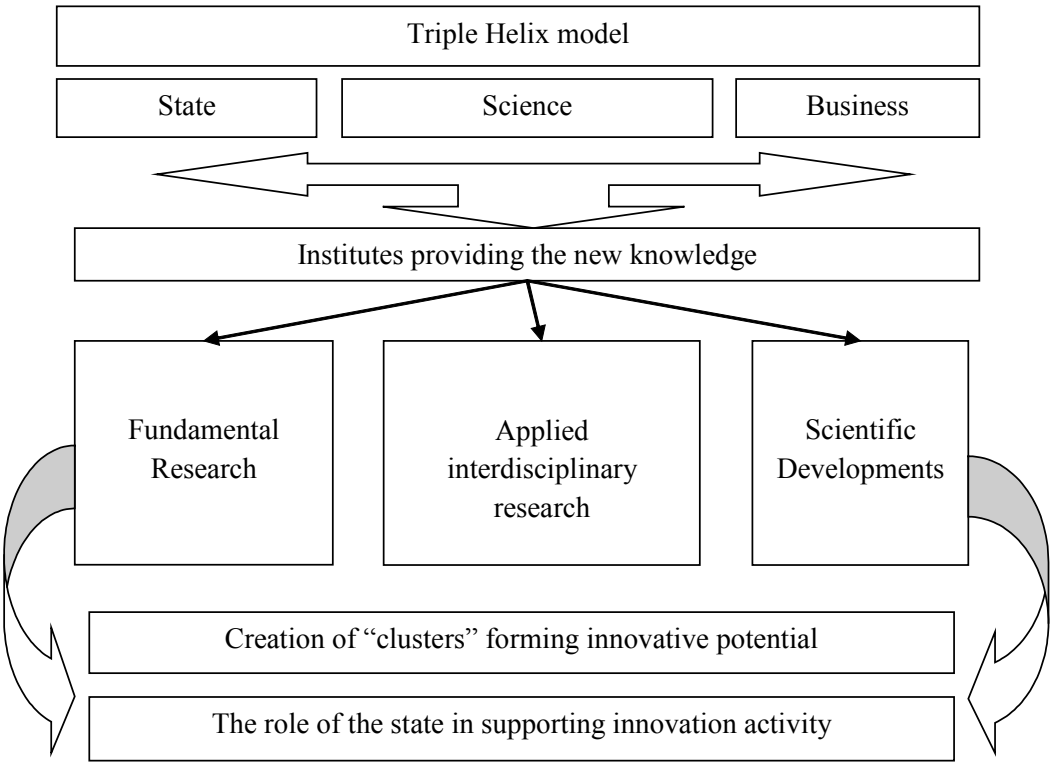

Figure 1 – Featers of Triple Helix Concept [3]

The evolution of the innovation system occurs in a collision of two development vectors that are not identical to each other (research and their applied use), which is reflected in the relationship between the two largest participants in innovation activity – firms and scientific organizations. Note that this contradiction is not unique to the administrative-command system. The top management of companies, as well as the administration of the planning system, often opposes innovations that

slow down the rhythm of established production. Therefore, an "alliance" is needed in the system of relations between business, government and the university sector of science.

Turning to the experience of building innovative systems and developing the innovative potential of the university sector of science, we note several models for the development of innovative activity in developed countries.

American model. Major US universities, being federal-significant scientific and educational centres, in most cases act as a powerful factor in the development of regions through the techno park structures that are formed during them. A characteristic feature of the American model is that the United States entered the 21st century as the undisputed leader in world economic development, maintaining superiority over other countries in terms of the scale of the economy, its level of development, scientific and technological potential and its effectiveness, the dynamism of the development of market mechanisms, the scope and effectiveness of state regulation of the economy. In the USA, they recognize that today the one who not only faster and better produces new knowledge and technologies, but the one who can quickly translate them into a specific product and enter the world market with it wins. It is in terms of comparing the levels of innovative ability of the nation, individual industries and companies that should be considered today threats that can interfere with American leadership in the world.

The experience of Japan is of undoubted interest in creating innovation centres. The country has made significant progress in integrating science and industry. The type of technology transfer she has chosen reflects the country's cultural traditions. Japan began the reorganization of the innovation system in 1998 after the adoption of a legislative act that provided, inter alia, for the establishment of technology transfer structures at universities approved by the government. From the point of view of the development of the innovation sphere, Asian countries depended and continue to depend on the Japanese economy and the technological policy of Japanese corporations. Japan supplies equipment and technology to Asian countries; Asian countries export consumer goods to the North American market. As part of this interaction, a Network informal model of Asian integration has been formed over the past decades.

The experience of Japan and the countries of the Pacific region show that the development of the innovation environment is carried out despite economic instability and a relatively low standard of living. Innovative development is associated with the "point" generation of competitive technologies produced by a network of innovation centres that concentrate elements such as the scientific base, production resources and an efficient commercial sector. This makes the current Russia and the Asia-Pacific countries at the beginning of technological transit similar in starting positions.

Since the early 1970s the first European innovation centres began to develop. Their functioning fits into the third model of the analysis of innovative transformations in the country based on the use of the potential of the education system, development features: the presence of one founder; the main activity is the leasing of land to owners of high-tech firms; a shorter period of formation, since they were based on existing experience; the availability of detailed programs and business plans; these were mainly large organizations that had contacts with mature firms.

Currently, the main directions of development of European innovation centres are: legally correct registration of rights to the idea (intellectual property); a competent technological and financial plan for bringing the idea to industrial production and its implementation on the market; the availability of suitable facilities for the creation of a prototype and production of the product; the availability of the necessary equipment for the operation of the equipment.

The indicated directions are also characteristic of Kazakhstani innovation centres. At the same time, unlike European countries, financial resources for the implementation of the considered stages of innovation in our country are not enough.

According to the European model, a new approach was developed, the basis of which was the creation of joint laboratories with industrial companies on the basis of equal partnership, where scientists conducted research, and industry representatives were responsible for the development and their implementation. Funding for such studies was carried out jointly by CNRS and firms. The contract form of technological cooperation has been preserved to the present (in the mid-1990s, about 4 thousand such contracts were in effect), although the emphasis is gradually shifting towards large long-term joint projects [6].

The European model is attractive because it takes into account economic transformations in the regions, touches upon studies on the assessment of the labor market and resource base of regions on the development of economic models of their functioning. The model touches upon such signs of the functioning of the innovative potential of the university sector of science as intellectual and information resources, innovative infrastructure, favorable conditions for the development of innovative activity based on the coordination of interests of business entities.

Finland is a more obvious example of the European model of the development of innovative activity on the basis of attracting the innovative potential of the university sector of science. If the United States relies on private capital to support innovation, the Finnish model is characterized by an active role of the state in financing research projects and programs. The importance of this approach is determined by the fact that the country focuses on the implementation of the main goal – a guarantee of high-quality and affordable education for all. At the stage of the start of innovation, the Finnish state offers many support programs for small and medium-sized businesses. State support programs include assistance in registering activities, consulting specialists, and providing loans. If innovation is assessed as highly promising, then the state through its regional venture funds provides loans to enterprises or provides special guarantees not only financially, but also in the direction of training specialists for innovative activities.

A vivid example of a successful innovation policy based on a training system, especially with a view to developing small and medium-sized businesses, is demonstrated by China. The experience of the PRC is of considerable importance due to the regional specifics of the analysis of the problems of the Far Eastern region, with which good-neighborly business relations are established.

High degree of legal support in the field of technology transfer; a tax system that exempts small enterprises involved in the development of new technologies from income tax; the system of their soft loans and financial support ensured the effective use of the scientific and technical potential and the innovative potential of universities and high profits from innovation. Over the years of reform, thanks to sound public policies, China has made an extremely fast transition from a conservative industrial society to a society of high science and technology. Recently, there has been no lack of attention from the Chinese authorities to stimulate innovation [6].

Considering the world experience in the development of innovative infrastructure and the creation of technology parks, given the versatility of research on innovative processes and the development of innovative potential, one should pay attention to the organizational structure of the functioning of the university sector of science. This is necessary in order to formulate conceptual features of the innovation potential management system.

A good example, covering the components of the innovative potential of the university sector of science in the system of interaction with entrepreneurial structures, is the analysis of the methodology of managing the innovative activity of subjects of national economies.

The study of foreign experience in building innovative systems based on the use of the innovative potential of the university sector of science has shown that an effective management system and organization of innovative activity is largely determined by the infrastructure, in which industrial parks and business incubators play an important role, operating in close collaboration with scientific and educational institutions and the business sector.

The main reason for the lack of effectiveness of the Kazakhstani NIS is the lack of interconnections between its main components. Foreign experience indicates that the successful functioning of NIS participants depends on the place and role of small innovative entrepreneurship in it, to which the state provides organizational, technical, legal, financial, marketing and other support. Research institutes and universities are engaged in research and development activities and continue to participate in the materialization of scientific knowledge through the creation of small innovative enterprises on their basis. Big business places orders with scientific organizations and continues to actively participate in research activities through the small and medium enterprises.

Thus, the analysis of foreign experience makes it possible to draw conclusions that allow us to note the consistency in the relationship of the state regulation system and private initiative for the development of innovative activities in order to ensure the competitiveness of business entities at various levels both domestically and abroad. The decisive role in the process of mobilizing innovative potential belongs to innovation centres based on the university sector of science. A comparison of

economic development trends in countries in supporting innovation is the starting point for the analysis of Russian experience and the specific structure of the economy, the changes in which are caused by many problems and contradictions in the country.

In our country, the principles of building links between science, industry and the state have practically not changed since Soviet times. The resources of science are still sufficiently preserved, although so far it has developed according to the inertial scenario. Its capabilities make it possible to become a driving force for innovation, but only if new forms of cooperation and interaction are created.

The institutional spheres of science, industry, and government, in addition to their traditional functions, should more actively acquire new ones characteristic of other participants in the innovation system. Academic research institutes and universities do not sufficiently adapt the tools of the business sector, opening up services for the commercialization of technologies and other similar structures, creating small firms.

The concept of the triple helix in Kazakhstan should acquire its own interpretation: it should simultaneously turn the coils representing NIS structures (state, education, science, production, infrastructure), their functions (forecasting, programming, implementation, monitoring, control, incentives), as well as resources (personnel, material and technical base, finance, regulatory institutions).

At the same time, the paradigm of innovation policy must be changed from reactive (its essence lies in attempts to respond to changing factors environment, including newly set administrative tasks) to proactive, the implementation of which would anticipates the future and creates a new model of NIS in Kazakhstan.

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Аңдатпа

Мақалада мемлекет, ғылым және бизнес одағын білдіретін үш инновациялық спираль тұжырымдамасының контекстінде ұлттық инновациялық жүйелердің дамуы қарастырылады. Негізгі себептерді негіздей отырып, үштік спираль моделінің пайда болуы және оның әлемдік қоғамдастықта дамуы қарастырылады. Тәжірибе жүзінде үш спираль моделінің негізгі сипаттамаларына жеткілікті егжей-тегжейлі талдау келтіріледі. Негізгі рөл ҒЗТКЖ-ны қолдау, университеттер арқылы ғылымды дамыту, ғылыми идеяларды коммерцияландыру, оның ішінде бизнес-инкубаторларды пайдалану түрінде мемлекетке беріледі. Қазақстанда мемлекеттің, ғылымның, бизнестің институционалдық салалары әзірше жеткілікті бытыраңқы күйде және олардың арасындағы тиімді өзара іс-қимыл жасалмады. Ұлттық инновациялық жүйелерді дамытудың шетелдік тәжірибесін, атап айтқанда, Финляндия, жапондық, қытайлық (жалпы оңтүстік-шығыс Азия бойынша) мысалында американдық, еуропалық тәжірибені пайдалану негізделеді. Үштік спираль моделінің белгілі бір әдістерін пайдаланған кезде қазақстандық инновациялық жүйені белсенді жолмен дамытуға болады. Ғылым, бизнес және үкімет өзінің дәстүрлі функцияларына қосымша инновациялық жүйенің басқа қатысушыларына тән жаңа функцияларға неғұрлым белсенді ие болуға тиіс.

Тірек сөздер: инновация, үштік, мемлекет, қоғам, бизнес, технология, коммерцияландыру, тиімділік.

Аннотация

В статье рассматривается развитие национальных инновационных систем в контексте концепции тройной спирали инноваций, подразумевающей союз государства, науки и бизнеса. Рассматривается возникновение модели тройной спирали с обоснованием основных причин и ее развитие в мировом сообществе, приводится достаточно подробный анализ основных характеристик модели тройной спирали на практике. Основная роль отводится государству в форме поддержки НИОКР, развития науки через университеты, коммерциализацию научных идей, в том числе с использованием бизнес-инкубаторов. Показано, что в Казахстане институциональные сферы государства, науки, бизнеса пока находятся в достаточно разрозненном состоянии и эффективное взаимодействие между ними не выстроено. Обосновывается использование зарубежного опыта развития национальных инновационных систем, в частности, американского опыта, европейского на примере Финляндии, японского, китайского (как и в целом по Юго-Восточной Азии). При использовании определенных методов модели тройной спирали возможно развитие казахстанской инновационной системы проактивным путем. Наука, бизнес и правительство в дополнение к своим традиционным функциям должны более активно обретать новые функции, свойственные другим участникам инновационной системы.

Ключевые слова: инновации, тройная спираль, государство, общество, бизнес, технологии, коммерциализация, эффективность.