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## **Innovational Development and its Regulation (International Experience)**

### STATEMENT OF THE PROBLEM

History of becoming innovation economics shows various examples of economic models activation and support innovational development. Thus there are examples of how countries are systematically moved to the innovative development and examples of countries that have performed or started an innovative breakthrough under the influence of public policy (usually starting with the date of the adoption of key legal act). Consideration of the theoretical aspects of innovation policy of foreign countries will allow to identify priorities for innovation policy in Ukraine.

The article aim is analyzing the features of the state innovation policy of countries related to the use of specific measures aimed at accelerating innovation development (various benefits, financial support, measures to improve the interaction between science and business) and the distribution of the role of government and private sector in these processes, aimed at identifying principles in the application of measures to stimulate innovative activity.

### ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The issue of state regulation of innovational activity devoted to labour of leading domestic and foreign scientists, among them [Izyumska, 2007, p. 41–45; Ivanonkiv, 2008, p. 23–30; Androshchuk, 2009, p. 72–88; Ennan, 2009, p. 92–95; Popovych, 2009, p. 57–71; Fedulova, 2009, p. 5–15] and others. However, not the features of forming and practical implementation of national innovation policies of foreign countries on the optimal combination of activity of state, a strong corporate sector and market infrastructure to create a national economic system of state regulation of research activities by means of methods to stimulate the process of creation and use of innovations in their organizational and economic structures.

## REGULATING OF INNOVATION DEVELOPMENT IN DEVELOPED COUNTRIES

Analyzing government policies of developed countries to support innovation in the degree of government regulation are two poles: on one are U.S. and UK, where the state intervenes smallest in the economy in general and in innovation in particular, on the other – France and Japan, where state most actively supports the innovation process by all possible means.

In the UK the practice of public research funding is implemented as a system of „double support”. Strategic funding carried out through one-time subsidy, parallel Department of Innovation, Universities and Competencies funding research councils, which in turn fund research in the country to project basis. Two types of innovative centers were created in the UK focus on the development of specific technologies and to promote its use (created in response to the needs or opportunities of business, for example, Printable Electronics Technology Centre (PETEC); and focused on a particular sector of economy or market (created for to bring together complementary disciplines of science, parts of the process chain, etc.).

In Ireland the government is crucial in attracting foreign investments in high-tech industries, one of the areas to stimulate the development of knowledge-intensive industries is the allocation of grants for research and development, lower tax rates for companies that perform research and development. To support immigration researchers to Ireland government of this country adopted the resolution of the European Community to involve researchers from third countries (EC Directive on Mobility of Researchers from Third Countries). In Ireland, supported by a number of initiatives to develop links between higher education and industry.

In Denmark the interaction between universities and industry less developed than in many other countries. An important part of the Danish innovation system is the GTS-institutes („Godkendt Teknologisk Service” – „approved technological service provider”), acting as a bridge between public and private entities. GTS-institutes are private independent consulting companies that develops and sells practical knowledge and technological services to private enterprises and public institutions. There are three main activities of GTS-institutes: self-development know-how, participation in joint projects with public research institutions and private companies, and commercial activities.

The problem of commercialization of innovative products in Switzerland is not supported by direct public investment. Special attention is paid to nanotechnology, engineering, circuits development, agriculture and biochemistry [Androshchuk, 2009, p. 408]. Transfer of innovative technologies in the industry carried out within existing support forms of companies, including start-ups, mainly in technology parks, both on federal and regional level.

In Norway focuses on the interaction of education and science: there is a large number of both public and private research institutes (accounting for almost 23% of all spending on research and development and approximately 27% of all sci-

entific research). Norway is able to ensure that foreign corporations operating in the local market held its technology localization in the country or transferred to the Norwegian research institutions. For this purpose used various promotions and compensations, resulting in Norway were formed shipbuilding companies, the IT sector associated with oil and gas production, there were innovations in the field of monitoring stocks in remote areas and in the technology of drilling and production in offshore.

Innovation policy in the Netherlands is characterized by a predominance of regional components, and is offset from the support lagging Northern regions to support regional economic benefits that are the driving force for national growth. Participation of the Netherlands in international programs of innovative collaboration centrally coordinated by the main ministries and agencies within their primary specialty.

In Spain, the main directions of state innovational policy is creating projects of Consortia Technological Research (CENIT), Fund of Funds and the program "Torres Quevedo". National Strategic Consortia Technological Research (NSCTR) are a form of practical tasks to improve the interaction of public and private organizations by creating and co-financing NSCTR. Fund of Funds combines venture capital funds to support the creation and development of high-tech companies. According to the program "Torres Quevedo" by saturation of the private sector university staff, funded by contracts with doctors of sciences and technologists to support research projects in companies.

In Israel, as one of the main instruments of innovation policy are international funds support innovation. Powerful tool for creating and implementing their own profitable projects are also system of grants for R&D in which the state co-funded projects for commercialization of technologies in different proportions, depending on the stage of project development.

In South Korea, first upgrade was based on borrowing foreign technologies, which took place in different forms: contracts „turnkey”, licensing and consultative services. Korean patent system is one of the most productive in the world. Korean Intellectual Property Office (KIPO) since 1997 reoriented on borrowing principles governing the patent of the United States. Patent policy has played an important role in small business development and capitalization of the universities.

Among the features of American innovation sphere should be made actually independent from the federal state agencies occurrence of the main institutions of innovation areas (technology parks and venture capital funds). Another feature of the innovative areas the U.S. is only high activity of small innovative companies, largely due to the existence of special government programs to support these firms, as well as the sophistication and availability of venture capital – the main source of funds. Other features of the U.S. innovation system is the large proportion of educated immigrants and a high level of competition among all participants of the innovation sphere.

In the sphere of innovations Belgium major event to support innovation at the state level was the creation of „High Level Group 3%” (High Level Group 3%, Haut conseil 3%), consisting of industrialists, academics and members of research organizations. Government finances 60% of the costs (50% for large companies) in the development of innovative or research project in the field of industry [Androshchuk, 2009, p. 343]. Innovation process in Belgium stimulated cluster policy, while in the process of technology transfer involved as well as scholars and students, are effective regional program to support innovation (Flanders). In Belgium there is no special regulation of technology parks, although many of them operate effectively.

Innovative potential of Austria is characterized by high R&D expenditures, high dependence on public funding (high share of firms that receive government subsidies for innovation) and at the same time – lack of training and low impact of new developments. In the country to maintain proper level innovative activity conducted appropriate institutional reforms to meet modern requirements, which resulted in the formation of „National Council for Scientific Research and Technology Development”, the main advisory body to the Federal Government in the field of innovation policy in Austria [Androshchuk, 2009, p. 341]. When moving to overseas markets high-tech products, especially in the implementation of major infrastructure projects Austrian companies in many cases appear in the cluster – associations of enterprises. Currently there are four such cluster: Austria Rail Engineering (ARE), Austrian Power and Environment Technology (APET), Austrian Health Care System (AHS), Austrian Technology Corporation (ATC).

Finland has paid great attention the development of technology parks, which are considered as one of the most important elements of innovation infrastructure.

In France, the share of government R&D expenditures in total expenditures for these purposes is 49.9%. French innovation policy aimed at stimulating private investment in science, improving collaboration between all key stakeholders of the innovation process within the poles of competitiveness and to support small and medium sized enterprises (SME). To improve the cooperation of project participants and technology transfer in France created a special innovation clusters („Sophia Antipolis”, „Marseille Innovation Cluster”), in state developed and launched a special program „Poles of Competitiveness”.

Important features of Sweden is a high level of education and training of public sector employment, the effective work of state institutions, a stable political system, developed venture capital market. However, the national support and encourage commercialization of research and development through the creation and development of new enterprises is often characterized as relatively weak and fragmented. One of the most serious problems of the Swedish innovation system is a relatively low level of science-intensive production outside of a few large, technically advanced multinationals.

In Germany, formed the legal framework of innovation systems, acts which can be divided into three groups – related to schools, research organizations and business sector. Especially successful is recognized operating system of patent laws, which provides, inter alia, simplified registration of inventions. Thus in Germany undeveloped incentives for doing research and innovation in the tax system, underdeveloped interaction of science and business.

In Japan, despite active government activity to develop strategies and programs for innovation development, much of the scientific and technological developments of applied nature, is still performed in the laboratories of large industrial corporations and remains within the same corporation, without the general transfer to potential users on the scale of the industry. Between public fundamental research and applied research in the private sector does not always comply with the necessary coordination.

#### REGULATING OF INNOVATION DEVELOPMENT IN DEVELOPING AND OTHERS COUNTRIES

In China from the 1980s a significant role in the development of innovative businesses play different types of privileged administrative-territorial units: special economic zones, areas of trade and economic development, industrial parks and others. These institutions have become a powerful tool for involvement of foreign companies and professionals, for which used the special benefits.

In Brazil, the public sector always dominated the funding of science and technology and increasing role of the private sector. In addition to tax incentives R&D, subsidies and co-financing interest rates, an important instrument of financial support innovation was the creation of specialized funds, directing part of the proceeds of taxation of key sectors in R&D projects selected by the State Committee. The disadvantages of innovation policy Brazil include the low level of conversion of knowledge into innovative products, focus on the innovation system of academic research, and lack of coordination between the processes of research, technology development, manufacturing and projects commercialization.

In Thailand, focuses on the development of nanotechnology. It created a network of high-tech parks, which include local universities, public and private research institutes, including with the involvement of foreign scientists, whose activities will focus on three main areas – the creation of new nanomaterials, and development of nanoelectronics and nanobiotechnology. The development of biotechnology related with the creation of the country's National Center for Genetic Engineering and Biotechnology (BIOTEC).

Republic of Indonesia is committed to entering a qualitatively higher level of technological development, however, still feels the shortage of qualified professionals and funds for research and development. The government of state

actively adopting the experience of technology parks, industrial parks, special economic zones with emphasis on the development of high-tech industries and scientific and technological development, but they are still in various stages of development. Among the problems faced by Indonesia, the first is the lack of information, on the second – the lack specific applied technology, the third – a lack of experts, then – lack of funding.

In the economy of India formed the sector innovation system is almost world class – automotive, information technology, communications, pharmaceuticals, and also nuclear power, space. There are 45 parks, which together produce 80% of exports of IT sector. In addition, owing to taken measures by government support of Indian information technology in India accounts for 65% of the global outsourcing market – this way, more than 300 multinational corporations transferred to it their departments to develop computer programs.

In Kazakhstan, the main development institute, responsible for innovation in the country is welfare fund „Samruk-Kazyna” and its subsidiary JSC „National Innovation Fund” (Nif). Also active position in the Republic of Kazakhstan in the sphere of innovation activity occupied large national companies (100% as part of the state). The country formed a two-tier system technology parks – national and regional, 3 of 13 Kazakhstani technology parks are located in universities, the remaining 10 operate in large industrial enterprises and research centers.

The legislation of Belarus for business innovation infrastructure provided preferences for scientific and technological parks, technology transfer centers and residents science and technology parks (income tax rate set at 10%). Also possible to obtain funds from the republican budget of the organization and development of logistics venture capital organization. In this mechanism, stimulating widespread in the results of R&D, almost no effect: the results of R&D, hardly find practical application in the economy and level of innovation activity of enterprises is 4 times lower than in EU countries.

#### THE NOVELTY OF THE RESEARCH

On the experience gained in different countries can find a number of success factors and defined the role of public policy, through which innovative development made possible.

One of the main factors of success of British innovation policy was the focus on private initiative. Unlike many other countries, the leading role in innovative development of the UK is not country: the country's innovation strategy focused primarily on the development of demand for innovation, practiced regional approach to investment.

In Ireland, although the private sector is a major generator of innovation, it is the state creates the basic conditions for innovation. The success of its national

innovation system can be described by three main components: inclusion of Ireland in the global financial system that led to a significant increase in foreign investment in the economy and the arrival of multinational corporations; the creation of innovative „fires” of development based on the country’s participation in international traffic technology and different forms of international information and technology cooperation; improve the quality of human capital through immigration into the country of skilled professionals (mostly former immigrants).

In the history of Denmark key role in creating conditions for new technologies played the public sector.

Important factors for success of innovative development of Switzerland became, first, a sequence of ongoing innovation policy. Second, the significant role played by its international orientation: a major emphasis on supporting national innovative enterprises in international research programs.

In Norway, support for basic research in institutes and universities is one of the main priorities of the Norwegian innovation policy. Free education could allow entry to leading universities and colleges for children with remote areas and disadvantaged groups. At the same time, the practice of lifelong education can increase workers’ skills throughout life.

The main factors of success in the Netherlands was the selective support of leading innovation regions and developed scientific and educational complex, which includes: a system of student support, technology transfer system in the scientific sector, developed network of research universities with public funding.

In Spain, a major role in innovative development plays a stirring interaction between state and private structures.

In Israel, a source of personnel and technology from which emerged the Israeli hi-tech industry, was the defense industry. Much attention in Israel historically paid to the problem of introducing new technologies into production. Also, Israelis learn from money management to international investors in the program Yozma, which played a crucial role in establishing the institute of venture investments in Israel. The important role played and the field of scientific cooperation, which is one of the key links that connect Israel with the Jewish diaspora in different parts of the world.

Quick and successful innovation development of South Korea was made possible by active borrowing of foreign technology and reasonable patent policies. Important role in the „economic miracle” Korea played a large financial-industrial groups that have long been the basis for national economic development.

One of the factors of successful development of the U.S. innovation system is to create conditions consistent and targeted measures to support entrepreneurship.

Significant progress of Thailand in improving competitiveness of its products and attracting foreign capital, which are observed in the last decade, due, primarily, purposeful steps the Government to develop industrial infrastructure and business.

The main success factors of innovation in Belgium became balanced regional innovation policy and sound system of financial support for innovation.

Success of Austria on the way of innovation development contribute structural support programs that were taken to organize cooperation of high-tech enterprises without tight binding to specific technological areas. In addition, there are well-established cooperation between higher professional schools and small and medium enterprises in the creation and innovation. Successfully developing network technology parks that create optimal conditions for the development of SMEs, including innovation. At the state level triggered the formation of clusters, which also is a way to support high-tech exports.

The main success factors of Finland include state ownership of shares in key firms, regulating interest rates, government support private sector, cooperation and public duty of the state of competition in the industry. Leading role in the development of telecommunication industry in Finland and the industry as a whole is owned by Nokia, a significant impact on long-term growth which made the state funding agency Tekes, which funded the 8% of total expenditures on R&D Nokia.

One of the main strengths of the national innovation system in France to promote the innovative development, became the poles of competitiveness, which allow to collaborate businesses, universities and researchers-developers.

A key success factor for innovation development in Sweden is a long-term large-scale investments in education, promoting the development of science.

In an innovative development in Germany has played an important role cooperation with the U.S. (post-war economic recovery), and the development of public-private partnership that was to some extent substitute for venture capital, which has received widespread in Germany.

Japanese experience of government support of the innovation process is controversial and can not be unequivocally successful. However, as conditions can be noted an intensive economic development, which became the basis for innovation.

The main factor in the successful development of innovative sector in countries that do not belong to the leaders of innovation development (Kazakhstan, Belarus, Indonesia, India, etc..) is the interaction with other countries and adoption of technologies and principles of state policy innovation.

## CONCLUSIONS

The analysis of innovation systems in different countries can be concluded that nowadays successful competition with the leading players in the world market without the creation and continuous improvement of the national innovation system is impossible. In most models of national innovation systems or major, or one of the key participants in a state.

Specific successful implementation of a national innovation system can significantly vary depending on the historical and economic context, for example,



for historical reasons, the American system is the most diversified and flexible, and Finnish, on the contrary – more structured. Thus both systems are effective. However, possible to formulate some guidelines common to different countries.

Successful development of the national innovation system contribute to the following factors:

- consistent and long-term innovation policy of the state with clearly articulated goals and objectives;
- rational use of existing innovative potential as the foundation for the formation of innovative economy and realization of innovation policy;
- systematic efforts to establish and strengthen cooperation between the private, research and educational sectors;
- identifying and targeting of important for innovation and technology potential trends which develop fast enough or do not develop independently;
- coverage of as many as possible of potentially innovative firms by providing them with state support;
- developed program of commercialization of innovations, created and borrowed technologies;
- valid attraction of foreign investments of transnational corporations;
- the presence of a developed legislation on intellectual property;
- systematic study and implementation of best international practices.

Among the factors that hinder the development of innovation systems, in particular, include the following:

- low share of business in financing R&D (France, Sweden, Netherlands, India);
- weak attraction of small business in innovation (France, Sweden, Netherlands, Japan);
- „brain drain” (France, Germany);
- territorial disparities in development (Germany, India, China, France, Norway);
- rapidly aging population (the European Union);
- high cost of military-industrial complex (Sweden, Israel);
- undeveloped venture capital markets (Denmark, Germany);
- problems of commercialization of innovations (India, Germany, Brazil);
- bureaucracy (India, Brazil, Asia).

Also, analysis of specific measures of public policy over the world, taking into account these shortcomings innovative systems allows to several components of the state innovation policy, which is usually used for the development of national innovation system:

- creating special organizations and bodies responsible for defining and implementing innovation policy (almost all countries);
- active cooperation with other countries in terms of technology transfer (almost all countries);
- creating innovative clusters (France, Germany);
- implementation of major innovations in the large transnational corporations (Sweden, France, Netherlands, India, Japan);

- providing free education (Germany, Norway);
- the use of „innovation vouchers” (Netherlands, UK, Germany);
- a significant direct budget financing R D in various forms.

## REFERENCES

- Androschuk G.O., 2009, *The program of innovation development of economy in Germany: a strategy of high technology Science and Innovation*, “Science and Innovation”, No. 3.
- Androschuk G.O., 2009, *Innovation policy in foreign countries: concepts, strategies, priorities. Information-analytical materials prepared by the Committee of Verkhovna Rada of Ukraine for Education and Science and the Ministry of Foreign Affairs of Ukraine*, p. 337–520. Accessed: <http://kno.rada.gov.ua/komosviti/doccatalog/document?id=48725>.
- Androschuk G.O., Ennan R.Y., 2009, *Innovation Policy of the European Union*, “Science and Innovation”, No. 5.
- Chukhno A., 2004, *Current problems of the strategy of economic and social development at the present stage*, “Economy of Ukraine”, No. 4.
- Fedulova L.I., 2009, *Approaches to the formation of an effective innovation strategy of Ukraine*, “Science and Innovation” Vol. 5, No. 3.
- Ganushchak L.M., 2006, *Ways of uses foreign experience of innovative potential of enterprises in Ukraine*, “Actual problems of the economy”, No. 4 (58).
- Innovative economic development: model, system of administration, public policy*, 2005, Ed. L.I. Fedulova, Osnova, Kyiv.
- Ivanonkiv O.O., 2008, *Foreign experience of economic systems development on the basis of innovation*, “Actual problems of the economy”, No. 5 (83).
- Izyumska V.A., 2007, *Implementation of state innovation policy in Ukraine*, “State and Regions”, Series: Public Administration”, No. 2.
- Karakay M., 2008, *The state’s role in stimulating innovation*, “Economy of Ukraine”, No. 3.
- Popovych O.S., 2009, *On the strategy of innovative development of Ukraine*, “Science and Innovation”, Vol. 5, No. 3.
- Vasilyeva N.V., 2011, *China: the formation of innovation system of the state development*, “Scientific Bulletin of the Academy of Municipal Management”, Series “Management” No. 2; [http://www.nbuv.gov.ua/portal/Soc\\_Gum/Nvamu\\_uprav/2011\\_2/10.pdf](http://www.nbuv.gov.ua/portal/Soc_Gum/Nvamu_uprav/2011_2/10.pdf).

## Summary

In the article the characteristics of the state innovation policy related to the use of specific measures aimed at accelerating the development of innovative, as well as the distribution of the role of government and the private sector in these processes are analyzed. On the basis of the analysis the patterns of incentive measures of innovative activity, factors that favor or impede innovative development and state innovation policy components that are used to develop the national innovation system are revealed.

**Rozwój innowacyjny i jego regulacja (doświadczenia międzynarodowe)***Streszczenie*

W artykule przedstawiono charakterystykę polityki innowacyjnej państwa dotyczącej stosowania szczególnych środków mających na celu przyspieszenie rozwoju innowacyjnego. Na podstawie analizy wzorców działalności innowacyjnej w opracowaniu ukazano czynniki, które sprzyjają lub utrudniają rozwój innowacji i prowadzenie polityki innowacyjnej przez państwo.