

# THE INNOVATION ECONOMICS FOR SUSTAINABLE DEVELOPMENT: THE UKRAINIAN CASE

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**Abstract:** Despite declared intention to implement the sustainable development principles, there is growing evidence that Ukraine doesn't achieve a good progress in economic, human and social policies. One of the main reasons of this is extremely low level of the innovation field development.

This paper discusses the challenges and opportunities of Ukrainian innovation economics. They are examined in comparison with the experiences of EU countries and non-EU country (Russia). The study focuses on the 3 I's (institutions, investments, information) and the 3 C's (creativity, communication, cooperation). This phraseology illustrates essential infrastructural elements and social conditions of the Innovation Economics. It covers two main aspects of the foundation of the Innovation Economics of Ukraine: the reasons, which negatively influence scales and speeds of the innovation processes, and transformations, needed for the innovation scenario realization.

The study highlights that the conditions, which are required for the foundation of the innovation economics, to be exact: the liberty of creation, economics liberty, high educational level, high level of scientific researches, of social capital and competitive industry of innovations, - are absent in Ukraine. The analysis shows that important differences exist in the national approaches of foundation and development of innovation economics in the EU and non-EU countries examined. It is also clear that the non-EU countries (Ukraine and Russia) face many common problems.

The results show some transformations in the trends in innovation level of Ukrainian economics, which is known as one of the key conditions of the sustainable development: development of the human resources, informational and communication infrastructure, development of the network cooperation on the national and global levels, development of the partnership among the government, science and

business, optimization of the direct finance regulation system and of the stimulus for the innovation activity.

**Keywords:** Economic Transformation, Innovation Infrastructure, Institutional Conditions, Sustainability.

## 1. INTRODUCTION

Innovation economics (economics of knowledge) while being fundamental civilization change, has created new background for the realization of the sustainable development conception. Why some countries have successfully transformed this background into a driver of balanced social and economics development? Why the others can't use appeared opportunities? Paradoxically, the unsuccessful example has taken place in Ukraine, where public sector doesn't look at stability achievement as at the national priority. On the levels of state (governance) and business there generally exists the gap between declared objectives and performance. In a considerable level this situation is connected with the fact, that Ukraine appeared to be an outsider in the global process of innovation economics formation. According to the Global Innovation Index rating in 2009 Ukraine obtained 64<sup>th</sup> place among 110 countries observed [23]. Country almost doesn't operate in the global high-tech market: share of high-tech production in the sales on the global market is extremely low and is equal to 0,05-0,06% (to compare in Russia it is 0,3-0,8%, in China – 6%).

Having by the moment of independency proclaiming in 1991 one of the biggest potentials (industrial, resource, human) in the Central and Eastern Europe, Ukraine didn't use it in full for the development optimization. Ukrainian transformation crisis appeared to be one of the most continuous and deep among transition countries (e.g. GDP decreased on 62% during the first nine years of independence). Despite the impressive growths in the next decade

between 1998 and 2007 (real GDP grew at 6,6% a year, twice as much as global GDP growth), be the beginning of the global downturn Ukraine couldn't change the structure of its economics, reduce its resource-demand and energy intensity, improve the ecological situation.

Still is actual the industry survival task, social standards support, the including of national economy into a global economics. Practically the model of "regenerative growth" is used instead of sustainable development. Economical reforms (privatization, changes in tax and credit systems) are run without paying attention to innovation factors.

Today Ukraine is faced to a difficult challenge. We are talking about creating of such institutes, which support long-term sustainable development on the basis of innovations. That's why it is important to try to understand the following – what are the conditions needed for the development of innovation economics and what are the barriers which cause difficulties to their realization in Ukraine? Which of the intuitional measures can intensify the existing extremely low correlation between innovations and economical growth? The objective of the study was to identify the main elements of the national innovation economics in the context of sustainable growth.

## II. THE INNOVATION FACTORS OF STABLE GROWTH

Innovational system combines the participants from the scientific sphere, business and politics, their interaction suggests development, using and exchanging of new knowledge and technologies, while complex effect of this interaction ensures sustainable development.

Changed relationships between science, technologies and economical growth are one of the main characteristics of "new" innovational economics [1]. This phenomenon is analyzed in a various works [14,15]. As discussed by L.M. Gohberg [9] the following most significant changes are allocated: (a) dynamics and quality of growth depend more and more from technological shifts in the economics on the basis of innovations; (b) technological progress is accelerated, products and services life cycle is reduced and especially among conducting the surveys, innovations development and implementation; (c) science more and more is oriented to the economics needs, share of enterprises sector in conducting and financing the surveys increases; innovational orientation of science also increases; (d) "new economy" – network economy, in which relationships have the system-forming role.

In different countries these changes have common and specific features, which are seen on macro- and

micro- level. The first characterizes innovational politics of the government, the second are connected with innovational behavior of the firms. What is interesting, in both cases right choice of strategy priorities, investment direction, effective form of the cooperation between the participants of the innovation process is important.

The transformation of knowledge and innovations into the factor of stable economical growth and competitiveness is a main trend in global economics of 21 century. The results of number of surveys affirms the high level of influence of innovational sector to the level and rate of economical development. In the countries with developed economics up to 85% of GDP increase is provided by high-tech industries and intellectual services. In 2000 the EU issued the ambitious challenge: to create by 2010 the most dynamic and competitive economics in the world, which is based on knowledge. According to forecasts, the increase in costs on R&D sector from 1,9% to 3% of GDP had to give an additional annual GDP growth equal to 0,5% and lead after 2010 to the annual creation of 400 thousand of new workplaces. The other tendency is seen in non-EU countries. As the authors of the EU funded BRUIT project state, "A comparison of Russia's and Ukraine's innovation performance, as expressed by the Summary Innovation Index, has found that both countries lag significantly behind most EU Member States in terms of their innovation performance" [16].

The successes of the developed countries affirm the right choice of the development priorities: the stimulation of the high-tech growth and of the innovational activity of all economy sectors has led to national economics competitiveness increase and augmentation of economical and social response from the innovations.

## III. THE 3 I'S AND THE 3 C'S OF AN INNOVATION ECONOMICS

What are the steps Ukraine must take to ensure the national potential is fulfilled? To answer this question, it's needed to make clear two important circumstances. First one is the background of the effective innovational system formation and successful operation. The second one is connected with an ability for Ukraine to realize these two conditions.

The factors of successful innovational activity are fully describes in the numerous of publications [7,10,19]. As basics ones are determined the following: priority in state policy of challenges of developing the science, technologies, knowledge and competitive enterprise sector, integration of the national system into a global innovation sphere. These are the necessary but insufficient conditions.

”Most-favoured-nation regime” for the innovational growth suggests the existence of economic liberty and public-business-state cooperation, absence of corruption and administrative barriers, accessibility to the venture capital and so on. Ukrainian and foreign experts admit that these conditions are absent today in Ukraine [4,11].

According to the rating of the World Economic Forum in 2009 Ukraine among 134 countries in the sphere of forming the factors of innovative development occupied the 52 place, by availability of modern technologies it occupied 65 place, in the sphere protection of rights of intellectual property – 114 place. Such results visually testify for inefficient usage of national innovative potential and extreme actuality of this problem solving. The incentive example for Ukraine are countries-leaders, which having favorable institutional basis have created national innovative systems, which are integrated on the international level and are supplying generating of knowledge and innovations, commercialization of new technologies. For the innovative environment of these countries the following is representative: (a) presence of varying forecast and strategy planning; (b) participation in the forming of global scientific and technical space and (c) high-tech goods and services market; (a) dominance in the definite segment of technological specialization in the high-tech production market; (b) forming of the global mechanisms of getting and redistribution the rent from the monopoly to the knowledge and high-tech; (c) state support of the human capital improving quality programs; Innovative economy characteristics were grouped and defined as 3 I’s - the essential infrastructural elements (institutions, investments, information) and the 3 C’s – the social conditions of the Innovation Economics.

### **Institutions**

Institutional aspect of innovative economy forming is important as knowledge as social phenomenon appears only if developed institutional environment is present. Close relations between institutes and knowledge requires presence of the special structured institutional environment as a basis of innovative development of the country.

Under institutes we understand the rules and mechanisms, which support their fulfillment, which structure repeating relations between people [6]. Complex of legal, finance and social institutes provides national innovative process. Communications within the scope of this process are stimulated by government policy, which is driven to support the requirements if sustainable development.

The role of government practically consists of

creating infrastructure and favorable institutional climate for innovative activity. For instance, in the OECD countries state initiatives to stimulate technological and non-technological innovations and to stimulate the demand of innovations are well regulated and operate successfully.

The estimation of social and economical influence of those R&D, which are financed by government is the first-priority/ In Ukraine the national innovative policy is mostly declarative, and isn’t a part of logical social and economical policy, which is oriented to the sustainable development. The important institute of innovative process support is the legal system, which regulates relations in the sphere of innovative economy. The main problem of Ukrainian legal system in this sphere is its isolation from practice. Such situation significantly complicate the regulative resources of political institutes.

Along with political institutes the drivers of the national innovative system development are economical institutes. They directly define dynamics of economical development of the country, as they define stimulus of economical agents, notably they define investments into physical and human capital, into technologies [2]. In Ukraine the efficient institutes of innovative activity support are absent in government, regional and industry levels.

T.Beck and R.Levine [22] surveyed the influence of the level of protection of private and intellectual property rights and other economical institutes on the distribution of capital to the firms. The results showed that these institutes influence on the efficiency with which finance systems distribute capital among industrial sectors. Countries with high level of institutes, which protect the rights of investors, distribute the actives flow from unprofitable firms to growing ones more efficient.

In Ukraine, the level of institutions is extremely low. This is evidential, for example from the data of Human Development Report (HDR) UN Development 2009-2010 years: Ukraine's rating in terms of quality of institutions was 20 among 133 countries [8]. By The Global Competitiveness Index of the Word Economic Forum – Ukraine occupied the 82 place - the worst result among post-Soviet countries: Lithuania - 53 place, Russia - 63 place, Kazakhstan - 67 place, Latvia - 68 place) [24].

Effective innovation system in Ukraine can not be created without the institutional changes. Such as improving the legal framework of innovation, the development of economic institutions that provide financing of business projects at all stages of the innovation cycle.

## Investments

Investments in knowledge are the basis of innovation and technological progress. In countries - leaders of innovation development the relevant government policy has two financial aspects. Firstly, the government is directly funding research, and secondly, with the help of special tax and other incentives it encourages spending on R&D by business sector. In the past

years the relationship between these measures in the OECD countries is changing. There is a shift from direct public financing of firm's R&D to the indirect funding (e.g., direct funding of R&D in 2005 was 7% compared with 11% in 1995)

As it is shown in the research [16] "In ranking of national innovation performance for 36 countries, Russia and Ukraine were only placed 27th and 35th respectively, The ratio of public expenditure on research and development (R&D) to gross domestic product (GDP) in Ukraine is less than 60% of the EU average and the ratio for business R&D expenditures is even worse – just 31%".

In Ukraine, part of the budget funds aimed at financing innovative activities in 2007 was amounted to only 1%. As a result, for the period 1993-2008 indicator of innovative activity of Ukrainian enterprises decreased in 2 times (from 26% to 13%) compared to its average value in the EU - around 60%. Innovative activities of enterprises are financed mainly from own funds of enterprises: 74% in 2007 (for comparison, the participation of private capital in financing of R&D in EU countries is 55% in the U.S.A. - 67%). External stimulation of this activity by the state in the form of tax and other preferences is absent.

In Ukraine, the network of venture financing only begins to form, in contrast to developed countries, where venture capital is the main source of financing of the innovative enterprises. The structure of venture investments in Ukraine has its own specifics. In the developed countries division is common: venture capital funds invest in projects at an early stage of development (start-up), private equity funds - at any stage. In Ukraine, these differences disappear. Means of venture capital funds (equity funds) are usually involved in the initial and subsequent stages of business development, when the company is considered by lending institutions as risky borrower and the cost of borrowing for this company is big enough.

It can be expected that as institutional reforms in Ukraine are held the current inefficient system of financing science and innovation will change. To stimulate innovation activity in the country a system of effective economic incentives to attract enterprises'

own resources and foreign investment should be established.

## Information

In the innovation economy, information (such as knowledge and science) plays a crucial role, and the interaction between the subjects of economy in many ways has the nature of information exchange on a global scale through extensive networking. (e.g., the Internet is a new infrastructure of the economy). In an economy based on knowledge "the opportunity and ability to access knowledge or join the network regarding their possession (training) determines socio-economic situation of firms and individuals» [13]. Distribution and usage of information technology means new ways to transfer, handling and processing of knowledge, as well as high speed of its transmission to the consumer. Due to this, ICTs have become in the last decade, the determining factor of social reproduction, a powerful stimulus of economic changes. ICTs have become a strategic accelerator of organizational and technological innovation of enterprises [12].

In Ukraine there is the Ukrainian Research and Academic Network URAN (URAN), which provides information services based on Internet technology to organizations and persons from the fields of education, science and culture. In 2007 an agreement on connecting URAN network to European science and educational network GEANT2 was signed. In a result access to scientific and information resources: digital libraries, databases and knowledge, information search engines, supercomputer centers to remote computing and scientific data, distance learning resources, was facilitated.

However today it is impossible to talk about high-level Ukrainian ICT sphere. In the World Economic Forum rating- the analysis of the network economy and infrastructure (Networked Readiness Index 2009-2010, NRI), Ukraine occupies the 82 place out of 133 countries. (Last year - 62) [25]. Therefore, for Ukraine remains the relevance of the national information space creation. It should be accessible to all participants of the innovation process (from the fields of science, education, business) and be integrated into the global information network. An example of such a network may be initiated in 2008 Project «Gate to Russian Business Innovation Networks» (Gate2RuBIN), which ensures the participation of Russian companies and research organizations in the largest Enterprise European Network (EEN). The participation of Ukrainian participants in such projects would give them a unique opportunity to find European partners and participate in business - and technology cooperation on the European scene.

## Creativity

Human capital as a carrier of skills, competencies, knowledge, as a producer of knowledge is a source of economic growth and development. Increasing of knowledge intensity in the innovation economy implies a growing need for highly skilled, creative workers. Opportunities of information and communication and other new technologies can be implemented only in presence of corresponding human resources. "Creativity is the driving force of economic growth and innovation» [17]. This fact affects the employment and productivity of labor situation: encouraging companies to seek ways to increase creative efficiency of workers. In developed countries, 25% of staff are employed today in the field of science and high technology. The average annual growth rate of employment of such workers amounts to 2,5% in the U.S.A. and 3,3% in the EU15 [12].

In Ukraine, the process of systemic transformation was accompanied by a huge reduced quality of human capital. This is evidenced by a steady decrease in the rating of Ukraine on human development index (HDI) UN on period 1991 - 2009: 99<sup>th</sup> - 45<sup>th</sup> place, 2005 - 78<sup>th</sup> place, 2009 - 85<sup>th</sup> place). Low labor productivity is linked also with declining quality of human capital. So, according to the study «Reviving Ukraine's Economic Growth» by McKinsey&Company, labor productivity is only 16% of the U.S.A level and about 30% relative to the average of EU [18]. Such a large backlog of labor productivity from the developed countries is a systemic challenge with the creation of a national innovation economy. However, the quality of human capital is recognized in the Ukraine as the main source formally - just at the level of official rhetoric and policy programs. It is recognized that a significant number of man-made disasters is caused by "human factor", i.e., incompetence, unprofessional staff.

It is well known that one of the main driving forces for development of intellectual capital and talent is the system of university education. Quality education and research activity of universities is a base of infrastructure of innovation economy. In the system of government priorities of Ukraine the attitude to university education as educational, support field, but not as productive and innovative one is formed

Accordingly to this, in most of Ukrainian universities research activity is considered as secondary compared to the educational, and of the low quality of the last one the ranking of the World Economic Forum testifies. According to this rating in 2009 the higher education in Ukraine occupied 45<sup>th</sup> place among 134 countries. Many experts agree on the fact,

that today the training at universities is conducted without the needs of businesses, especially innovative one. A good program of institutional reform transformations in education and in labor relations can improve the situation.

## Communication

Innovation economy is an economy of global networking among economic actors. Effectiveness (impact) of innovation development of economy do not only dependent on their own individual economic actors effectiveness (firms, research organizations, universities), but also on "how they interact with each other as elements of a collective system of creation and usage of knowledge, as well as with public institutions (such as values, norms, law)" [20]. All the variety of relationships both within the country and international ones, acquires in innovation economy bigger importance. In the report of the European Commission global networked economy is defined as "an environment in which any company or individual, in any location of the economic system, can communicate easily and cost-effectively with any other company or individual on the joint work, for trade, to exchange ideas and know-how" [21].

Such quality of communication is ensured by constant deepening of scientific and technical relations between the countries and the empowerment of the modern means of communication. In a global communication process the wide spreading of research results, the movement of technology flows (patents, licenses, know-how, scientific and technical information) is noticed.

One of the main priorities of the formation of the national innovation system is the structural and technological restructuring of the economy through the transfer of new technologies. Of particular interest are new technologies in energy, water management, agricultural production, transport and waste management, environmentally clean technologies. Now in Ukraine the project of creating Ukrainian Technology Transfer Network (UTTN) is discussed. It is intended to be created in a partnership with Russian Technology Transfer Network (RTTN), which in 2002 became the first such a network in the CIS. In Europe, 68 Innovation Relay Centers (IRC) as components of an integrated European platform of transnational technology transfer stimulation and promotion of innovative services operate.

Organization of technology transfer from science to production and in the opposite direction (in the case of industrial application developments relevant to science), creates a foundation for the emergence of cooperative relations in research and development between business and science and technology sector.

## Cooperation

OECD describes the national innovation system as a set of institutions that belong to the private and public sectors, which individually and together, interact to cause the development and spreading of new technologies within a particular state. An important condition for the success of such an interaction is the cooperation between the state and private businesses, so-called public-private partnership. In Ukraine, this condition is poorly executed: the state does not have explicit terms of priorities of innovation development, its relationship with business are unfavorable for innovation. Low level of cooperation is observed between other innovative interaction participants. The peculiarity of Ukrainian innovation system is the relative isolation of research organizations, universities and businesses from each other. Cooperation between them is not very common and highly localized.

In contrast, co-operation is a major feature of innovative programs of the EU. Their purpose is to promote European cooperation between different actors of R & D (research centers, universities, private companies). On the basis of cooperation the coordination of innovation policies of countries-member of the EU is organized, the best national experience of innovation creating is spread. There has been a sharp increase in the globalization of scientific and technological activities, including research: International co-authorship, cross-border cooperation in the field of inventions.

New ideas, new forms of cooperation of scientific and industrial sectors are developed in the systems of innovation clusters. This association consists of various organizations: Industrial companies, universities, technology parks and business incubators, research centers and laboratories, banking and non-banking credit organizations, investment and innovative companies, venture funds, governments, NGOs, etc.. Cooperation between them can get a synergistic effect from the distribution of new knowledge, scientific discoveries and inventions.

## IV. OVERVIEW OF THE UKRAINE'S INNOVATION ECONOMICS BARRIERS

The small scale and low rate of innovation development in Ukraine can be explained by the presence of numerous constraints: institutional, economic, financial, technical, social. The most important of which are the following: (a) institutional barriers between science, education and business; (b) inefficient economic mechanisms of science, commercialization and technology transfer, their practical implementation in the production; (c) deficit of finance resources, poor regulation of investment, credit, tax and customs incentives; (d) the

fragmentation and contradictory of legal framework, lack of resolution of several legal challenges in the field of protection and use of intellectual property; (e) lack of innovative network infrastructure; (f) underdeveloped competitive environment, lack of business demand for innovation and incentives for their introduction, the low level of entrepreneurial culture; (g) low level of equipment of universities and educational RD equipment, lack of their involvement in research activities, the unsatisfactory level of training.

As a result of the marked negative factors the economic trend of Ukraine was formed: technological gap with developed countries of the world, structural backwardness and low competitiveness of the economy. Today reserves of economy growth at the expense of traditional low-tech industries and the irrational use of energy and natural resources are exhausted. The conclusion regarding Russia is fully applicable to the modern Ukrainian situation: "At present, not so much the sector of science and technology pulls up the rest of the country's economy as the rest of the economy of post-Soviet Russia pulls down the sector of science and technology" [5]. If such trends continue, we can expect irreversible degradation of the innovation sector - science, high-tech sectors, education. Therefore, the speedy modernization of the national innovation system is the premium issue.

## V. INNOVATION OBJECTIVES AND INSTITUTIONAL CHALLENGES

Specificity of Ukraine's transition to an innovative sustainable development is determined by two factors. On the one hand, the basis of such a transition is formed by modernization of traditional sectors of Ukrainian economy (mining and metallurgy, fuel and energy, agriculture). On the other hand, innovations are a driver of economic growth. Innovation scenario requires changes in several areas, the essence of which can be expressed by the word "development": human capital, network cooperation at the national and global levels; partnership between government, science and business systems, direct measures of financial regulation and incentives for innovative activity.

In general, timely and necessary are thought the following steps: (a) *To overcome declarative of state innovation policy*. It is needed to approve the national priorities in the light of available natural, financial and intellectual resources, and create an innovative model of development. (b) *To create a system for interactive planning*. It is needed to apply Foresight - a long-term scientific and technological sector forecast of science and technology, made on the basis of an objective study of its current state. Long-term estimation of prospects of this sector will identify the

strengths and weaknesses of Ukraine's position on key areas of science and technology, to link requests of research companies. (c) *Improve the system of legislative regulation.* We need to establish a system of state guarantees of the protection of intellectual property rights, regulation of venture funds. (d) Develop a mechanism of program funding. It is necessary to strengthen the orientation of the funds and establish a mechanism to pass-through innovation cycle (fundamental science - applied research - development - innovation - the consumption of innovative products). (e) Generate the tools of economic incentives. It is necessary to implement mechanisms for tax incentives, credit and customs incentives for innovation development (f) *Strengthen cooperation process.* We need to create research universities, implementing research programs and provide high quality of human capital through the use of science. . Create a national innovation clusters. (g) *To adequately assess the effectiveness of innovation.* We need to establish a unified state accounting system for the results of research carried out by the state budget. This assessment will determine the effectiveness of public spending, their contribution to the socio-economic goals.

The totality of these measures should contribute to the formation of competitive innovation system in Ukraine that can respond flexibly and rapidly to changes and new challenges.

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