

FROM THE INNOVATION THEORY AND POLICY

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Abstract

The main aim of the paper is the presentation of the very important question from the innovation theory and policy. According to the new theory of growth being the best theoretical foundation for the concept of the innovation system, the primary factor influencing the economic growth is the endogenous technological progress. To the particular goals of the research belong the presentation of the technological and organizational nature of innovations products and innovations process, regional dimension of innovation system, dependence between the innovation system and innovation process, technological, complementary and additive alliances as well as consortia for research and development (R&D), business consulting, knowledge-absorbing business services (KIBS) and links between science, industry and governance. The important results of the research is the conclusion that in the innovation process very important are the connection between science (universities), market (industry) and governance. There is positive dependence between innovation activity and effectiveness of the innovation process. The more interaction and cooperation it can observe on the regional level than on the state. Strategic technological alliances are seen mainly in the modern sectors like biotechnology or information technology, where the costs of product development are particularly high. An increasingly important role in the innovation of companies, mainly industrial ones, plays consulting and knowledge-absorbing business services (KIBS).

Keywords: innovation theory, innovation system, innovation process, strategic technological alliances, business consulting

Introduction¹

Innovations determining the competitiveness have not only technological dimension, but also the organizational and personal one – the quality of human resources is extremely important for the profitability and the development of an organization. Moreover, significant is the nature of the innovation process that is interactive and based on the cooperation. The today ground-breaking technologies are so complex that individual companies would not be able to develop them alone. Their complexity makes it impossible to

understand all the details by a single expert, as well as the knowledge on this topic may not be fully and thoroughly transferred to the other people.

Research and Methods

The main objective of the research task is the presentation of the very important question from the innovation theory and policy. The particular goals of the research belong the presentation of the technological and organizational nature of innovations products and innovations process, regional dimension of innovation system, dependence between the innovation system and innovation process, technological, complementary and additive alliances as well as consortia for research and development (R&D), business consulting, knowledge-absorbing business services (KIBS) and links between science, industry and governance.

The analyzed problems were solved with the use of both quantitative and qualitative research methods. The main research method applied in this analysis, was a method of scientific study used for splitting the whole (of individual items, their sets, phenomena) by means of logical abstraction. It was also used the analogy (comparative) method, which consists in finding similarities and differences between the items under study, the documentation method and statistical methods. It were applied the descriptive method, as well as methods of descriptive statistics and forecasting. Additionally, it were used the methods of deductive and inductive forecasting.

Results and Discussion

What indicates the importance and innovativeness of the research is the presentation of the very important question from the innovation theory and policy. According to the new theory of growth being the best theoretical foundation for the concept of the innovation system, the primary factor influencing the economic growth is the endogenous technological progress. In the endogenous theories workers are seen as an element capable of active interaction and creating changes in the production process, and therefore a huge role in increasing productivity is ascribed to human capital and knowledge. A significant role for the efficiency of the innovation system plays the environment, especially the consumers of innovation, who create the demand. They are important in particular nowadays in the times of the

market-driven economy. Companies monitoring the tastes of consumers, create new needs through innovations. Also important for the efficiency of the innovation system is the infrastructure of the environment, meaning the legislation, and in particular the protection of intellectual property rights as well as the systems of education, financing and transport. Companies are a critical element in the innovation system, and their health determines the competitiveness of countries and social well-being. Knowledge is the primary factor in determining productivity.

The technological change must take into account the diversity of products, processes, economic entities and institutions. The interdependence of these different actors will be important, i.e. it must relate more to the system than individual units. From the perspective of the theory of growth based on the endogenous technological progress, the efficient innovation system – distributing knowledge, meaning accelerating the learning processes in the economy, will stimulate a higher general level of the particular economic development. The concept of the innovation system emphasizes the cooperation as well as the flow of technology and information and various relationships and interactions between individual elements as a condition conducive to the success of the innovation process.

The research into the innovations in companies demonstrate that there is much more interaction and cooperation among the elements of the innovation system that occurs at the level of the region than the country. This results in the emphasis in recent years to research the potential and the regional innovation systems. In response to the need and assuming greater efficiency of the actions taken nearer to the entities, most regions that possess their own local authorities creates their own policy and proinnovation strategy.

Companies and other innovation system actors can be linked in the innovation process in many ways. The basic traditional method are the transactional links based on the market. However, the increasingly frequent are non-market links, which are manifested in the cooperation agreements concerning joint research and development and innovation activity. The cooperation between the partners in the economic process and particularly the innovative one shows increasingly popular concepts of networks and clusters, industrial districts and innovation systems, among both researchers and politicians.

Strategic technological alliances are seen in the modern sectors like biotechnology or information technology, where the costs of product development are

particularly high. In the case of such new sectors, where knowledge is non-standard, the source of innovation is the network and not individual companies. Very important in these companies is the learning process, the faster it is the larger is the participation in networks of cooperation (access to knowledge), and the larger are the company's ability to use this knowledge and create on its basis (absorption capacity). Enabling a network of cooperation is a fundamental development strategy, for example for biotechnological companies. The alliances are developing quickly also in the services sector in areas such as banking, insurance and air transport.

For companies of one industry, which compete at the same product market, it is possible that cooperation on the R&D will decrease the private R&D, as the higher expenses of a given company will mean the lower potential profits, and hence the participation in the consortium could reduce the motivation to intensify its R&D. In the case of consortia with the participation of the government, however, regarding usually companies from different sectors, the cooperation on R&D will reduce the competition in the market of the final product, and therefore can stimulate larger private R&D.

An increasingly important role in the innovation of companies, plays consulting and knowledge-absorbing business services (KIBS). These are commercial companies that operate around the field of science and industry, and can be regarded as knowledge brokers. They also introduce innovations themselves and they are the main source of innovations in the services sector. KIBS is often a hightechnology service companies. Knowledge-absorbing business services are companies providing the services of high intellectual value added to other companies.

An efficient innovation system introducing innovation and competitiveness of companies must have the proper linkages between science, industry and governance. The national policy can affect the science sector more than companies, so stronger links between science, industry and governance can be inspired by the reform of the educational system.

Technological and Organizational Nature of Innovations Products and Innovations Process

In the most general view, innovations are the new solutions, models or designs which have economical meaning. The concept of innovation is a complex and heterogeneous one. Innovations may apply both to products, i.e. the results of the activities of a

manufacturing company, and to the methods of production, i.e. the manufacturing process. This leads to distinguishing between product innovations (regarding goods and services) and process innovations, which may be of a technological or organizational nature.

Some product innovations are transformed into the process innovations within their „second incarnation”. This applies only to investment products, not those intended for direct consumption. For instance, an industrial robot is a product when it is being produced, and a process, when it is used in the manufacturing process. Product and process innovation are closely related to each other in many other ways. In the presented division, only goods and technological processes are the „material" kind of innovation. Innovations concerning the organizational processes and the services are regarded non-material innovations [1]. Most significant to the changes in the structure of the production process and product innovations and process innovations as an essential condition for the competitiveness of companies, regardless of the country, sector or region [2].

Companies, by introducing to the market new products and services, change and respond to the needs of customers, while providing themselves with the profits and existence. Innovations are not always based on the research activities of particular companies, but rather on the technology created by others. Moreover, with the high both risk and cost of the research and development process more and more entities decide to cooperate in this regard. The linear model of innovations regarding the innovation process as a static process with successive phases: 1) research, 2) development, 3) design, tools, 4) manufacturing, 5) marketing, very rarely appears to be useful.

The modern approach to innovation, namely the so-called chain model, underlines the complexity of the innovation process and the uncertainty of its results, which increase often the need to return to the earlier stages. The chain model shows at the same time that applied research may lead to fundamental discoveries, which means that innovation of companies depends on the quality of relations between others companies that generate knowledge and innovation in the economy. It has been seen in the concept of an innovation system that translates the observations of nonlinearity and the chain-like nature of innovation process into the functioning of the economy, development of which depends on the generated innovations [3].

According to this concept, the economy is not only the institutions which create it (meaning entities), but also the results of synergies, which arise as a result of mutual

cooperation. Therefore, apart from the institutions that generate knowledge and innovation (companies), the research-and-development sphere or intermediaries in the transfer of innovation in the concept that sees the importance of different interactions that occur between them. The innovation system consists therefore of institutions and relations between them, thanks to which the particular economy creates an efficient mechanism for the distribution of knowledge with a view to its further processing.

Important for the efficiency of the innovation system is the infrastructure of the environment [4], meaning the legislation, and in particular the protection of intellectual property rights as well as the systems of education, financing and transport. A key feature of the systems is the historically established culture and the accumulation of knowledge and experience making their character unique. Moreover, for the efficiency of the innovation system as distributing knowledge, its openness to influences and knowledge from other systems and the interactions with them [5].

An efficient system also has to be fully developed, i.e. it should not be missing any needed elements. The system will be the system if its entities are linked, because the system is a ordered arrangement of elements, between which there are certain relationships which constitute a whole. Such a system will be as strong as its weakest link.

Companies are a critical element in the innovation system, and their health determines the competitiveness of countries and social well-being. In the view of the new theory of economic growth developed by such researchers as Kenneth Arrow, Paul Romer and Robert Lucas, knowledge is the primary factor in determining productivity. According to the new theory of growth being the best theoretical foundation for the concept of the innovation system, the primary factor influencing the economic growth is the endogenous technical progress. In the endogenous theories workers are seen as an element capable of active interaction and creating changes in the production process, and therefore a huge role in increasing productivity is ascribed to human capital and knowledge.

P. Romer has enabled the analysis of learning process, noticing that thanks to the gained external benefits from it, the knowledge inspired by private investments becomes publicly available. In addition, the latest examining of endogenous progress assumes that it is the result of investments by companies in the work of R&D. As Carlsson reckons every theory that is trying to endogenize the technological change must take into account the diversity of products, processes, economic

entities and institutions. In addition, the interdependence of these different actors will be important, i.e. it must relate more to the system than individual units. From the perspective of the theory of growth based on the endogenous technological progress, the efficient innovation system – distributing knowledge, meaning accelerating the learning processes in the economy, will stimulate a higher general level of the particular economic development [6].

The concept of the innovation system emphasizes the cooperation as well as the flow of technology and information and various relationships and interactions between individual elements as a condition conducive to the success of the innovation process. OECD gives, among others, the following definitions of innovation systems derived from analyses on national innovation systems:

- the network of public and private sector, whose activities and interrelations initiate, import, modify and expand new technologies;
- the group of institutions which both together and individually contribute to the development and diffusion of new technologies, and creates a skeleton, within which the governments formulate and implement the policies influencing the innovation process; the system of interconnected institutions that create, store and transfer knowledge, skills and tools that define new technologies.

In the broader view, the innovation system consists of the following elements:

1. The institutions that generate knowledge and innovation:
 - companies;
 - institutions intermediary in the transfer of technology, knowledge-absorbing round-the-business services (KIBS),
 - public education and the area of research: universities and scientific institutes (public, private),
 - public authority to the extent of how the research inspire and introduce innovation.
2. The channels of knowledge transfer: interactions and interdependencies between the institutions:
 - direct innovative relationships – imply the direct activity in the research and development area or cooperation for a specific innovation:
 - interactions between companies – the vertical and horizontal linkages: the joint creation of new knowledge, applied research and experimental development - cooperation in the field of R&D, shared patents, joint publications; interactions with the KIBS; interactions within the company – between different departments and stages of the innovation process,
 - the interactions between companies and the public area of R&D, i.e. The world of science

and the intermediary institutions – joint patents, research, publications, etc.,

- indirect innovative relationships – less associated with a particular innovation, and increasing overall innovation potential of companies, can replace the work of R&D:
 - the market diffusion of technology, i.e. the acquisition of technology identified as machinery, buying external knowledge/know-how,
 - mobility of workers and transfer the so-called tacit knowledge i.e. the hidden, non-material knowledge resulting from the experience and learning process, identified as employees,
 - other: interactions with the environment.

3. Environment:

- the market – the demand for innovation,
- the public authorities and their policies – legislation: the protection of intellectual rights, pro-innovative policy etc.,
- a system of employees education (system of learning and training),
- the infrastructure for innovation – the financial, communication, transport system in the particular region.

4. Characteristics

- openness - relations also with innovation centres and the knowledge from the outside of that system,
- a behavioural culture at a company level, the attitudes of public authorities, local community – the institutions characteristics resulting from the „roots“ in the given environment, historically formed specificity of a given system,
- completeness – the presence of all necessary elements.

Innovation systems are tested at various levels. The majority of analyses are conducted on national innovation systems, since it is considered that the characteristics distinctive to individual nations most affect the distinctness of the innovation process in companies: the type and number of institutions and their behaviour [7].

Regional Dimension of Innovation System

The research into the innovations in companies conducted in the Community Innovation Survey I in the countries of the European Union have demonstrated that there is much more interaction and cooperation among the elements of the innovation system that occurs at the level of the region than the country [8]. This results in the emphasis in recent years to research the potential and the regional innovation systems [9]. In response to the need and assuming greater efficiency of the actions taken nearer to the entities, most regions that possess their own

local authorities creates their own policy and proinnovation strategy. The reflection of the importance of the regional level for the innovation process are the European Union programs supporting the creation of regional innovation strategies – RIS, regional initiatives for the innovation and technology transfer – RITTS, and similar national programmes as e.g. InnoRegio in Germany [10].

The criteria and the concepts for regionalization are quite complex. In the foreground there is an option subscribed to egalitarianism, i.e. the standardization as opposed to very far-reaching diversity. Diversity mainly concerns economic functions and cultural identity but not the level of income and living conditions of the population. The frequently asked question is how to use the given area or territory by industry, how to organize the economic space? The founder of the theory of international factorial exchange B. Ohlin noted that the location theory is more extensive than the theory of international trade [11]. As a result, a great part of the theory of international trade may be used in the theory of the location where some of its aspects are very useful [12]. An important characteristic of the European regions is also a high degree of innovation.

The regionalization is to extract the spatial units of relatively homogeneous characteristics (geographical, demographic, cultural, economic) in order to ensure the proper growth pace for regions by giving them a specific amount of self-control. This causes a problem of the content-relation nature of the topics under the freedom of decision-making. Among the regions that are weak and strong, crucial and peripheral, stagnant and developing, we distinguish border regions called also the cross-border regions. Their particularity is that are situated along the borders separating adjacent two or more countries.

Favouring the broad development of the cross-border cooperation and using also the Euro-regional institutions, it has become necessary to ensure the expansion and modernization of cooperative relations and communication centres located in the border regions with the rest of the country. This should affect the extension of the benefits of cross-border cooperation to areas situated in the centre of the country, the support of this cooperation by the centres of science and innovation that are located next to the border regions, and eliminate the threats of „periphery location" in the new layout, after elimination the function of the border line as dividing the countries.

The undoubted impact on the development of cross-border cooperation have also transnational corporations. They create new jobs and generate technical and

organizational progress. In the face of the increasing globalization of the world economy, their role in the border regions, where there are no customs and non-tariff barriers, will increase. Transnational corporations are at the same time carrying globalization, and the latter fosters their worldwide expansion. On the other hand, in view of the processes of globalization, the role of regional cooperation will increase [13]. In the future corporatism and regionalism may become the dominating factors in the development of the world economy.

Dependence between Innovation System and Innovation Process

The concept of the innovation system is a comprehensive look at the innovation process. Fumio Kodama points out that the existing categories of innovation and the measurements still do not cover all types of innovation. After Charles Freeman [14], he distinguishes, besides radical and improving innovations, other kinds of technological change like the change of the technological system and techno-economic paradigm. The existing categories of innovation are not exhaustive, especially in the conditions of the modern economy, with the computer revolution as its integral element. In the modern economy, among other things, thanks to the use of computer techniques, the innovation can be realized by combining products and processes held by various companies from various sectors of the economy, as well as businesses and other entities, particularly from the field of research and development. In many industries new economy causes modularity of innovative activity. Innovations – their individual modules, are subcontracted to particular vendors, so that the company achieves flexibility and reduces costs (e.g. large automotive factory). The necessary response to the modularity of economy is a comprehensive approach to the innovation process.

Managers of many successful companies often are ashamed to admit that they cannot understand the reasons for the success of their corporations. Usually however, these are companies largely based on a variety of networks. In the case of the complex technology, a network includes a dozen of companies and different governmental agencies and organizations of the non-profit sector, such as universities. In addition, such a network, integrating various skills, must not be static. Innovative networks are continually evolving. Similarly, particular elements are still subject to common learning process. Often cited here as an example is Japan, where companies can effectively implement complex technologies. The factors of success that are mentioned here is the participation of the government in the innovation process – the support from his part and the

specific culture which fosters cooperation, trust and building innovation on non-material knowledge.

The new nature of the innovation process makes it necessary to adapt not only to its standards of measurement, but also the law. For example, in the United States of America in the 1980s. the anti-monopolistic law was changed so as to enable the creation of consortia of research and development between companies. In a later period it appeared that companies must obtain a permit for a consortium, if it relates to companies from the same industry. In the European Community in 1985 there was introduced a block exclusion from the article 85 of the Treaty of Rome setting out the rules of competition law for certain categories of consortia of research and development.

The concept of the innovation system is a comprehensive way to view the innovation process. It draws attention both on the institutional aspects – the need to bring other institutions supporting the innovation process of companies, but especially on the relations between companies and those institutions, as well as between companies. The interactions between companies and institutions shall mean their mutual openness and knowledge about the generated innovations, which will enable a more rapid diffusion of knowledge and innovation in the economy and social system to adapt more rapidly to technological change [15].

Many studies point at the positive relationship between cooperation and innovation and competitiveness of businesses. In Canada on average 1/3 of the industrial companies participates in the various agreements for cooperation. A greater percentage of cooperating companies is among large companies – 37.2% than the small and medium-sized companies -28,3%. At the same time, among large companies there are more innovative companies (89,6 %) than the average for the entire industrial sector is (82.3%) [16]. The cooperation is of crucial importance for an increase in creativity and innovation in the UK. From the research based on the internet survey conducted by the Confederation of British Industry (CBI) in the year 2000 it appears that 75% of 350 companies surveyed co-operated with other companies, researchers, consultants, research institutes or private research companies over the last 3 years (2000-2003) [17].

Companies and other innovation system actors can be linked in the innovation process in many ways. The basic traditional method are the transactional links based on the market. However, the increasingly frequent are non-market links, which are manifested in the cooperation agreements concerning joint research and development

and innovation activity. There are agreements between companies – both horizontal and vertical, as well as agreements between companies and public sphere of research and development, which are non-market players. The agreement may take various forms – formal or informal, occasional or long-term, may have a different geographical scope, may be of two or more partners, and the partners can be of various sort. The agreement may be unilateral – when one entity complements with their resources another, or bilateral – mutual. The cooperation between the partners in the economic process and particularly the innovative one shows increasingly popular concepts of networks and clusters and innovation systems, among both researchers and politicians [18].

Science and innovation are key factors that will help Europe to move towards smart, sustainable, inclusive growth, and along the way to tackle its pressing societal challenges. But Europe suffers from a number of critical weaknesses in its science and innovation system which contribute to the above problem. The key driver of the problems is Europe's structural innovation gap: compared to its competitors, Europe's patenting performance is weak and it lags behind in developing new products, new processes and new services. To boost productivity and growth, it is critically important to generate breakthrough technologies and translate them into new products, processes and services. Europe has taken an early technological lead in many key technology areas, but in the face of growing competition its advantage is tenuous, and has not translated into an innovative and competitive lead. A timely and targeted European policy is needed for bridging the "valley of death" if Europe is to remain competitive [19].

This key driver is underpinned by the following structural problem drivers:

- Insufficient contribution of research and innovation to tackling societal challenges
- Insufficient technological leadership and innovation capability of firms
- The need to strengthen the science base
- Insufficient cross-border coordination.

The EU recognizes the urgency of the situation, and is responding with new policy strategies. Europe 2020 and the Innovation Union initiative have clearly signalled the EU's intention to rise to the challenge. Europe 2020 focuses on achieving smart growth, while the Innovation Union sets out measures to contribute to this aim, including increasing investment, refocusing R&D and innovation policy on major societal challenges, and strengthening the links from frontier research right through to commercialisation. In addition, the European Council has market for knowledge, research and

innovation, which will require both funding and nonfunding measures. A key challenge for the EU in implementing its strategy will be to build a next-generation expenditure programme which matches this level of ambition in both its budget and its aspirations [20].

Technological, Complementary and Additive Alliances as well as Consortia for Research and Development (R&D)

The basic type of relation analyzed in the case of research on the innovative systems are links between companies. According to the recommendations of the OECD, referring to the examination of national innovation systems, they includes technical cooperation between companies and more informal interactions. Strategic technological alliances are seen mainly in the modern sectors like biotechnology or information technology, where the costs of product development are particularly high. In the case of such new sectors, where knowledge is non-standard, the source of innovation is the network and not individual companies. Very important in these companies is the learning process, the faster it is the larger is the participation in networks of cooperation (access to knowledge), and the larger are the company's ability to use this knowledge and create on its basis (absorption capacity). Enabling a network of cooperation is a fundamental development strategy, for example for biotechnological companies investigated by Powell.

Agreements may be unilateral – when one of the companies with their resources complements the resources of the other or partnership-like – twin-sided. Another division of strategic alliances for innovation are the complementary, production and additive alliances[21]. Complementary alliances include connecting companies with different core competencies and market shares. There are present, for example, when one company creates a product whose sale may be developed thanks to the competence of the second. Into the production alliances go companies wishing to achieve benefit in the manufacture of a component or implementation of a separate phase of the production process. Then these components are integrated into the production of each of the partners, as well as sold on the market.

Additive alliance link partners producing and selling the product together. In contrast to the complementary alliances contributions of partners are similar. The purpose of alliances is to reduce the cost of research and development. The market gets one product. Strategic alliances are established mostly in the technologically

advanced sectors like microelectronics, aerospace, automotive, telecommunications, production of new materials and biotechnology [22]. In the new sectors it is often necessary for innovation to combine the flexibility and initiative of small businesses and large engineering and marketing capabilities, as well as cooperation with the sphere of scientific research projects and governmental agendas. The studies carried out within the framework of the Community Innovation Survey I (CIS) in 1996 in the European Union has demonstrated, however, that the cooperation agreement regarding innovation concern not only the high-technology sectors. According to the CIS I in the wood and paper industry the innovative companies were also usually parts of a larger network. The R&D agreements were widespread but more popular among large companies: less than 5% of companies employing 50 workers belonged to these agreements, while this was more than 60% of companies employing more than 1000 employees. The main source of business partners was the region – 48% of companies and the whole country – 24% of companies, 9% of companies had agreements with the companies from other member countries UE. In addition, the alliances are developing quickly in the services sector in areas such as banking, insurance and air transport.

The study of the effects of research and development consortia in Japan conducted by Sakakibara has shown that the cooperative form of research and development stimulates private expenses of R&D – on average, in the absence of a consortium, private projects would be roughly at the level of 34% of the realized in case of cooperative R&D. In these consortia the government has the share, which they appoint. The government also determines the total size of the project. The rest is covered by companies. The expenditure of the government, however, are complementary, i.e. they do not replace private. On average, the government finances 53% of the project, while private R&D cover 47%. This means that the creation of a consortium increases private expenditures on average by 34% – in the absence of the consortium, up to 47% of the value of the cooperative project. Such an increase in private expenditure is allocated to the increase in efficiency of R&D, to the effect of putting their R&D on the productivity of R&D of others. In addition, through the cooperation companies are able to internalize the exterior effects arising from the research within the group, and thus maintain their motivation to conduct the research work. Also there appears the effect of learning at the level of the consortium. It means that the cooperative R&D constitute a „forced spreading effect". This effect for the members of the consortium is significantly larger than it would be if there was the absence of cooperation, which is a stimulus for the participants to increase R&D.

Additionally, the collaboration will affect the competition on the product market [23].

Business Consulting, Knowledge-Absorbing Business Service (KIBS) and Links between Science, Industry and Governance

Consulting and knowledge-absorbing business services (KIBS). have a stronger relationship with the public science than traditional sectors, and the interactions with them foster the innovation among traditional companies. Thus they serve similarly to the public infrastructure that supports innovation, the role of intermediaries between science and industry. Muller and Zenker define knowledge-absorbing business services as companies providing the services of high intellectual value added, mainly to other companies. They distinguish, after Miles, two kinds of KIBS - KIBS I, i.e. the traditional professional services which intensively use new technologies (marketing, advertising, etc.) and KIBS II – the new KIBS based on technologies (e.g. software and other activities related to the computer industry).

The activity of KIBS can be represented in terms of a cycle of knowledge covering KIBS and their customers by highlighting the 3 basic steps in the process of production and diffusion of knowledge. 1) the acquisition of new knowledge, 2) the phase of recombination of knowledge 3) the transfer of knowledge to the client. The acquisition of knowledge is based on interaction with customers by teaching during the process of solving customers problems. During the second phase, there is a transformation of knowledge previously gained, partially covering its codification and improvement of the newly created knowledge [24]. To some extent, this allows KIBS to create their own market. At the end the application of knowledge in the form of new and improved services constitutes a partial knowledge transfer to the clients. The diffusion of knowledge is associated with the new possibilities of interaction and the creation of knowledge, so there is a loopback. The importance of KIBS for the innovation system is dual-track like: direct – through, for example, the innovation of KIBS as new suppliers of knowledge and indirect – for example, through the impact on innovation of companies-clients. The direct relation between companies in the innovation process constitute also the cooperation with the public sphere of scientific and research [25].

An efficient innovation system introducing innovation and competitiveness of companies must have the proper linkages between science, industry and governance [26]. This requires a change in attitudes of companies to this cooperation as well as the reform of the public sphere of research and development in the

direction of greater adjustment of its research and of the directions and methods of education to the needs of the economy [27]. The scientific and technical policies of the countries moving towards the knowledge based economy favour the linkage between universities, industry and governance, competitive and based on cooperation forms of funding the scientific research, which is to strengthen the functions of learning in supporting and generating innovation. At the same time, the science sector should fall within the network of links with local, regional, national and foreign partners [28]. As a result of such activity the boundaries between institutions shall disappear, and the entire system becomes more dynamic.

Conclusions

It must be emphasized that structural reforms are necessary to facilitate adjustment and improve the framework conditions for economic growth. Reforms promoting job creation, investment in innovation, skills and inclusive growth are necessary to tackle the risk of hysteresis and alleviate the negative impact of the world economic crisis on social conditions. A fair distribution of the adjustment burden across society is important for sustained growth. Ultimately, however, a coherent policy mix encompassing both macro-financial and structural policies is indispensable for growth to resume. Hence a determined policy action on all these fronts is necessary to counter the negative dynamics and improve the economic situation in a sustainable manner.

The important of the research is the conclusion that in the innovation process and technological change very important are the connection between science, market (industry) and government. There is positive dependence between innovation activity in innovation system and effectiveness of the innovation process. Structural reforms, which improve competitiveness, wage responsiveness and price flexibility are key to improving adjustment capabilities and to stimulating the transfer of resources from declining to growing hightechnological sectors.

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