

Technological Innovations in Economic Development: Conceptual Bases and Practices of Introduction into Modern Conditions

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Abstract: In this article the role of technological innovations in economic development is based on fundamental theories. The theoretic-methodological base for this work is a research of innovation technologies of businessmen-innovator after Schumpeter, basis innovations in the base of big cycles of economic market condition of Kondratiev, competence of technical-economic paradigm of Dosi and Freeman, methods to overstep “technological stalemate” in works of Mensch and Kliaynknekht, technological mode of Glasiev. The goal indexes, made by the Strategy of innovation development of Russian federation for the period till 2020, prove the importance of technological type innovations in modern economic conditions. The analysis of experience of innovation technologies assimilation in Belgorod region allows to give a positive valuation and at the same time to find problems of economic character, also to indicate ways of their solution. In particular the high price of use of renewable energy resources, as a rule, transforms innovation projects into economic unprofitable projects. With all that there is a proposition about expediency of realization of bioenergy projects in agro holding activities. Results of calculations allow to see the economic efficacy of such innovation projects and availability of additional effects in adjacent branches.

Key words: Innovations • Technological innovations • Economic development • Businessman-innovator • Technological mode • Cycle of economic market condition • Technological-economic paradigm • Technological stalemate • Cluster • Innovation activity • Biotechnology • Bioenergy • Efficacy

INTRODUCTION

The world economic experience proves that the introduction of innovation technologies is a necessary condition for creating of preconditions for stable social-economic development. The level of competition possibility of modern economics is identified by involvement into international scientific-technological exchange and by efficacy of involvement of innovations into manufacture-economic complex. Those statements are understood and accepted between representatives of scientific community and power and management representatives of manufactures / organizations of Russia. In particular the strategy of innovation development of Russian Federation for period till 2020 has goal meanings of indexes which characterize a sphere of innovation

activity, including a part of manufactures of industrial production which execute technological innovations, in common quantity of manufactures of industrial production 40-50%; the part of Russia on world markets of high-technology products and services-5-10% and 5-7 and more sectors of economy; the export part of Russian high-technology products into the common volume of world export volume of high-technology products-2% etc. So the topicality of this topic of research doesn't give rise to doubts.

To base on earlier received scientific results [2, 3], we summarize theoretical opinion about the role of technological innovations in economic development and we value examples of practice assimilation of innovation technologies in Belgorod region.

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Main Part: The research of questions of interconnection of innovation technologies with parameters of economic growth started from XX century.

The first time the thesis about the leader role of businessman-innovator, using a new combination of manufacture factors, was stimulated by the Australian scientist J. Schumpeter in 1912 [4]. According Schumpeter opinion, the technological originality allows a businessman to reach the market success.

The scientist built his research on integration of equilibrium-static and evolution-dynamic methods. His static model of economy development is characterized by routine economic circulation, cycle repetition and manufacture renewal. With all that they provide an equality of products price, according to its marginal utility and a price of manufacture methods, according to their marginal productivity. The economic system is in this condition till the moment when it receives an impulse for development.

Schumpeter describes the economic development through the theory of economic dynamics. The development is an exit into a new trajectory of economic circulation, evident on the practice and on people minds. According the scientist's opinion, the source of development is a new combination of manufactures factors, i.e. the result of businessman-innovator activities.

J. Schumpeter worked out the classification of such innovation combinations which represent an inexhaustible source of economic systems growth:

- Use of new equipment, new technologies and new market manufacture provision;
- Use of products with new qualities;
- Use of new raw material;
- Changes into manufacture organization and methods of its financial-technological provision;
- Appearance of new sale markets.

But in the Schumpeter theory the innovations are not only a catalyst of economic activity, but an effective instrument of competitive struggle. The using of innovation combinations allows a producer to change totally a market condition. The potential danger of a new person appearance on the market with an original innovation idea exists even on high-monopolize markets and also on markets with active competitive struggle. This condition forces even businessmen-leaders to do an active work for looking for a scientific work of new technological decisions.

So, according to Schumpeter work, the perfection of functioning and the development of new technologies and methods of manufacture is one of the most important functions of a businessman-innovator on a market.

The important role in exposure of technologies role into an economic development belongs to the author of the world known wave theory-Russian economist N.D. Kondratiev.

The most important conclusions in Kondratiev work are conclusions about a recurrence of economic processes in the world scale. The statistics of indexes of social-economic development of some west-European countries for more than 140 years was the base for creating "long waves" or big cycles of economic market condition [5]. With short-time (3-3.5 years) and middle-time (7-11 years) waves, the long-time Kondratiev cycles (48-55 years) build the base of economic theory of development till now.

The base of every cycle, as Kondratiev proved, is composed by strong technological method of manufacture (or technological mode), determined by some scientific principles and resources, used into manufacture of financial and energetic resources. Two times during the century there is an exchange of technological mode, it is an impulse for economic development and it determines a competitive possibility of economy.

There is a close connection between Kondratiev cycles and a conception of technological-economical paradigm. The appearance of this conception is connected with west economist names-G. Dosi [6], C. Freeman etc. This method supposes a research of questions about innovations appearance, assimilation of base technological innovations into interconnection with reaction for exchanges in social-institutional structure. The period of development of technological-economical paradigm is executed with a big cycle of economic market conditions of N.D. Kondratiev.

Some propositions of this theory were developed into works of G. Mensch, A. Kliaynkneht. In particular Mensch [7] looked at manufacture development like at transfer from one "technological stalemate" (depression into economic development) to another. He thought the depression was a generator of conditions for base innovations appearance and economy reanimation. C. Freeman thought that collection of extreme innovations is for period of long wave raise. This thesis was developed by A. Kliaynkneht, who gave a statement that clusters of innovation-products form during depression period, but innovation-processes concentrate on "increase" part of wave.

Between researches of problems of innovation-technology development the conception of technological modes is very popular in Russia. The definition of “technological mode” was made by S.U. Glasiev like “groups of technological aggregate, connected with each other by one-type technological chains and formed reproduced integrities” [9]. For every technological mode the authors found the kernel, key factors and organization-economy method of regulation. According to this theory every new mode is born, as a rule, at the time when the previous mode reaches its dawn.

The importance of S.Y. Glasiev research is in a deep work into a problem of transfer of Russian economy to new technological mode. According the scientist opinion, the modern condition of scientific-manufacture potential of RF, especially structure changes of world economy, gives Russia the possibility (due to fast increase of innovation activity in key directions of growth of 6th technological mode) to take a place into a new long wave of world development [10]. This statement took place in the strategy of innovation development of RF for period till 2020 and in normative law acts of regional level.

In particular in Belgorod region they realize very active measures for building a new economy. In the region they accepted laws which define organizations, law's, economy conditions and guarantees of innovation activity, in particular they provide for reduce of tax for innovation business in several types of taxes (tax for profit of organization and tax for property).

Complex of problems for modernization and innovation development of region is solved by a cluster method. There are 3 groups of regional clusters [11]:

- Clusters in traditional sectors of economy: mining and smelting, building, agricultural. They form more than 50% of regional produce and characterize by high results in innovation sphere;
- Development clusters: machine-building, tourist-recreation, transport-logistic, multi component social cluster.

Now for those clusters groups there is a new system and new instruments for their realization. With this aim there is a long-time aim program “Modernization of machine-building complex of Belgorod region for 2012-2016”, there is a project of long-time aim program “Development of inner and entry tourism in the region for 2013-2015”, there are grant competitions for execution of scientific-research works for priority directions of social-economic development of the region.

- Perspective innovation clusters of the 6th technological mode: biotechnology, nanotechnology, information technology. Their development defines volumes of manufacture of innovation products.

In those directions Belgorod region has the leader positions in Russia. So the scientific-technic center of biotechnology in agriculture produces 5 types of enzyme-probiotic additions, used in mixed fodder manufacture (Farmer KM, ProStop, Fitos, Lactovit, Silvit); with MSU named after Lomonosov they worked out series of microbiological preparation “Belgor”, their efficacy is proved in Belgorod region manufactures; there is an experimental-manufacture lot of granule bio-fertilizer; in 2014 CJSC “Factory of premix ¹1” will start to work for lysine issue.

The practical experience in the region, received with designing, building and issue for exploitation of wind-generators, sunlight batteries, two bio-gas stations “Baytsury” and “Luchky”, summary power of electricity energy generation 3.1 megawatt give reasons to plan future development of bioenergy in Belgorod region.

They formed the beginning in the nanotechnology sphere. During last two years they started to produce innovation nanotechnology products; organizations like limited company “Skif” and “Factory “Painting “KVIL” in Belgorod, Belgorod factory of sapphires “Monocrystal” in Shebekino. In 2012 the limited company “Vegetative fibre” starts to issue products in Alekseevka city, limited company “Taksifolia” in Belgorod.

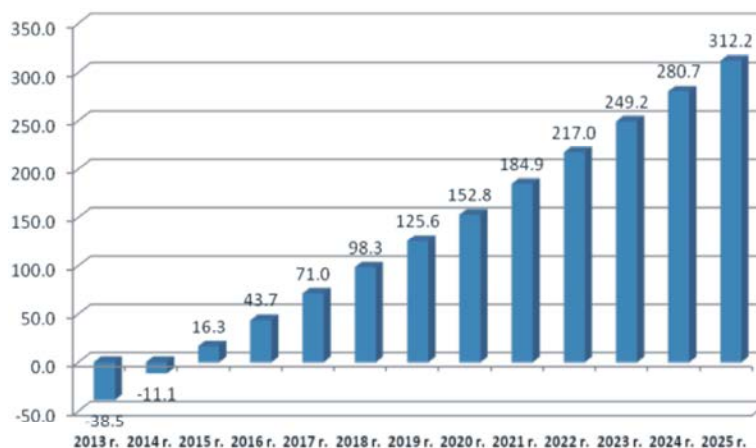
The important investment into results of innovation activity in a region makes a universities sector. In particular in program of strategy development BSTU named after V.G. Shukhov realizes some perspective directions, connected with creation of special composite materials with interactive qualities (with High engineer school in Ales, France and RHTU named after D.I. Mendeleev), radiation-protection materials for nuclear energy (with Rosatom), materials for aviation and cosmos purpose, including elements of active protection (with NINC MSU named after Lomonosov) etc.

But the practice assimilation of innovation technologies is always close to some economic difficulties.

For example the introduction of pilot project for Belgorod region-bio-gas station “Baytsury” in “Regional center of biotechnologies” in base conditions is economy ineffective in nearest future perspective (Picture 1).



Picture 1: Dynamics NPV of project-bio-gas station “Baytsury”, million rub.



Picture 2: Dynamics NPV of project of introduction of fertilizer separation system and additional increase for power for 300 kilowatt on “Baytsury”, million rub.

The RCB aim is in introduction and adaptation of innovation technologies of processing of organic waste for manufacture of electro-energy from renewable sources. The bio-gas station works for processing and deactivation organic waste.

The project “Baytsury”, using very simple technologies, is innovation project for Russia, but economy attractiveness of such projects is under danger due to the practice of cross financing, absence of penalty for non-observance of ecological and sanitary demands.

For “Baytsury” like for all innovation projects with renewable sources of energy (RSE) the main provided part of benefit is a realization of electro-power, heat energy and fertilizer are by-products and can't be sealed in current market conditions. Nevertheless free heat energy can be used for drying organic fertilizer after separation.

According to many researches organic fertilizer influences positively not only to crop productivity but it increase soil fertility for long-time period, they don't

receive large application between plant cultivation manufactures due to high labor expenditures for their “not momentary” efficacy.

In received organic fertilizer all substances transform to the form which absorbed well by plants, it makes them very effective right after putting them into soil. Putting liquid organic fertilizer into soil, it helps to conserve the liquid even during dry weather and thanks to humus materials it improves soil physical qualities, also the fertilizer assists in assimilation of minerals from soil in bound state [12].

With all this information the realization of organic fertilizer can be an additional profit for bio-gas projects. The price of such fertilizer (7% of dry substance), going from price of active substances (NPK 0,6% 0,6% 0,3%) is 300 rub for M³. If they execute the fertilizer separation for reducing expenses for transportation and importation, the price of dry substance will be 1600 rub for one ton, i.e. for project “Baytsury” the potential benefit can be 9 051 thousand rub.

In those conditions on the base of “Regional center of biotechnology” the innovation project of introduction of machine for separation of organic fertilizer and increasing the manufacture power till 800 kilowatt was economically proved.

The calculation of basic technic-economic indexes shows that projects with using biomass like basic substrate can be economically effective in conditions of detailed work of sale markets for products and low fuel expenses (picture 2). As a biomass in Belgorod region conditions they recommend to use manufacture waste of AMC and food manufacture.

Those results of valuation of innovation project take into account not only economic indexes, but as we have already said, the meaning of innovation projects does not restrict itself to economic effects. In particular the realization of this project will have an effect on increase of crop capacity and soil fertility, change of expensive fertilizer for agriculture manufacture and as a consequence, increase of ecological safe of environmental and manufactured food stuff, it will give a good health for population.

Creation of separate generation on the base of those objects improves the creation of energy-independent region. Undoubtedly electro stations cant totally replace traditional energy-generating objects, but using of it will give an economy of expensive, slowly renewable resources, will provide the reserve of manufacture in case of stoppages with energy delivery from traditional electro stations.

Taking those effects and calculated economy effect into account, we can conclude that such projects (with their enough technic-economy work out) have rights to live and can be successfully realized in Russia.

CONCLUSION

All fundamental innovation theories with some differences have one base and are a logical continuation and development of each other. But at the same time we need to underline their problematic moments and contradictions.

First of all there is a disputable statement that new technological mode (big cycle of economy market condition, technic-economic paradigm) appears as a result of the end of possibilities of base technologies, redistribution of resources from “old” technological systems to “new” ones. On the practice very often we can see an existence of “old” and “new” technologies,

resources etc. For example, now they actively use some energy carriers, from wood, coal, petrol, gas to wind and biological sources.

Second, there is a question about “fluidity” of transfer of one technological mode to another one. As a rule, bifurcation conditions take some period of time, they don’t happen instantly. Sometimes simultaneously some technological modes can work without future development.

Besides in the modern world the processes of globalization and informatization of economy bring us to dithering of national and time borders of technological mode. Now it is difficult to divide governments according to the level of technological mode, also to see the period of the beginning and the end of cycle of economy market condition. With all that we need to notice that the science-technic level, increasing from one mode to another, asks more expenses for its development. This thing asks for a detailed prove of directions of innovation development on a government level and its territory regions.

In Belgorod region there is an innovation scenario of development for period till 2020, on its base there is a principle of forming of additional cost on base of cluster approach with using of mechanisms of government-private partnership, project and program management. It forms necessary conditions for improve competition possibility of regional manufactures and clusters, it assists in putting the region on leader position in Russia by perspective directions of development of innovation economy.

During last years in Belgorod region, as in all world, there is a high interest for questions of using renewable sources of energy. It can be explained by some objective reasons, connected with science-technic progress, appearance of alternative sources of energy, ecological problems.

But on the practice there are circumstances which restrain the using of renewable energy sources. First of all it is stipulated by big investments into infrastructure and technological provision, also difficulty of objective valuation of efficacy of using those energy resources.

In this work on base of “Regional Center of Biotechnology” they analyzed the project of bio-gas station, power 500 kilowatt, for manufacture of electro energy by fermentation of biomass (organic waste) and an investment project of installation of system of fertilizer separation and increase of manufacture power till 800 kilowatt.

Calculated economy effect is acceptable, but such projects can become the basic generator of finance stream for investor, that's why better to realize projects of bioenergy in frame of agro-holdings activities which can take not only economy profit from products sale but to utilize waste of stock-raising departments, putting high effective and safe fertilizer on fields, increasing their fertility and common manufacture profitability.

Inference:

- The research of concept bases of innovation in context of this work topic prove the importance of technological innovations in economy development.
- The analyze of practice experience of putting of innovation technologies on the Belgorod region level allows to conclude the existence of mechanism of realization of cluster innovation policy.
- Projects of putting of innovation technological mode ask for deep and all-sides technic-economy basis. So with valuation of efficacy of using renewable sources of energy along with finance indexes it is necessary to pay attention to aspects of energy and ecology safe.

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