

# DEVELOPMENT STRATEGY

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## Basic provisions of Russia’s innovation industrialization concept\*

*The article deals with the basic provisions of Russia’s innovation modernization concept.*



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***Main results of the development of previous programmes for scientific and technological modernization.*** In 2002 – 2008 and in 2009 – 2011, within the framework of the RAS presidium fundamental research programmes, the inferential research was carried out in the sphere of innovation modernization of Russia’s economy.

The research enabled to establish the areas of promising technologies’ generation and extension, to outline the major directions of exploratory and basic research with regard to socio-economic factors. The global technological development trends have been revealed including the development trends in the following economic sectors: natural

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resources extraction and processing, energy production, manufacturing and high-tech industries, final products production, the creation of innovation and industrial infrastructure [1, 2].

During the Programme's implementation in 2011, the dynamics of Russia's innovation development for 1998 – 2008 was evaluated, which confirmed its rather modest increase. By 2008, the development level has reached only 42% as compared to the 2000 standards for the EU countries. If in the following years, Russia retained its development rates achieved in 1998 – 2008, then the transition to the EU standards of 2000 could last another 20 – 25 years. It should be noted that many of the standards characterizing the innovation environment in the U.S. and Japan, exceed the EU standards, and the EU countries themselves have significantly raised their standards by the end of the first decade of the 21st century as compared to the 2000s level.

The studies estimating the dynamics of Russia's economy transition to the innovation standards show its rather slow and gradual nature. In order to analyze the reasons for such a slow transition and find the factors for its acceleration, a "road map" of innovation economic development was worked out. The essence of the "road map" lies in defining the independent, but considered as interconnected, developmental factors, marked "milestone points" of movement in every direction, and in determining the logical and functional links between the latter.

Such conditions at the first stage include: the restoration of the balanced capacity of the main links of the innovation cycle (science – R&D – industrial development); the adoption of efficient measures for attracting young researchers in science; the increase in the share of innovation-active enterprises up to 30%; the creation of a network of engineering centres on the comprehensive development of innovation; the improvement of the validity of scientific and

technological forecasts, which facilitates their use in the processes of drafting and adoption of political and economic decisions; the increase of expenditures on science, including an increase in the share of business expenditures on innovation, etc.

The Programme proposes a hierarchical system of competitiveness capacity assessment, taking into account that of the country, complexes, branches, products and technologies. It is shown that although Russia ranked 58 among 131 countries by the competitiveness rating estimated according to M. Porter's model by the World Economic Forum experts in 2007, in fact, it was understated by about 10 p. In 2010 – 2011 Russia's rating was even more downgraded, and Russia ranked 63 according to it. The analysis of Russian industries' competitiveness capacity for 2006 – 2008 proved, that the most competitive ones include export-oriented extractive industries, as well as the sectors (communications, transport) based on relatively advanced technologies that produce final products, and establish infrastructure. The industries of the manufacturing and processing sector, production of machinery and equipment are at the bottom of the rating. In the developed countries, e.g. the U.S. and the EU countries, the processing and manufacturing industries account for the main share of GVA [1].

The 2009 – 2011 Programme studies the influence of the countries' scientific-technological development capacity on the emergence of the world financial crisis and its overcoming. It has been established, that technologically advanced countries were influenced by the effects of the crisis to a lesser extent, in addition, they actively used this potential to overcome its consequences. For example, the enterprises in such developed countries as the U.S. and Germany in the 2009 – 2010 crisis period, increased their R&D and technology expenditures, and as for Russia and Ukraine, their companies, on the contrary, reduced these expenditures.

The fact that in the crisis conditions, the companies in the technologically advanced countries and those lagging behind act differently, only confirms the role of scientific and technological potential in the market conditions.

The Programme also substantiates the inevitability of abandoning the domination of the resource-based export strategy in the RF economic development, because such a strategy is not a promising one, besides, it is based on the sufficient amount of reserves, the depletion of which is expected in 2015 – 2020. It is noted, that since 1993 Russia has already exported more than 2 billion tons of oil and nearly 3.5 trillion cubic meters of natural gas for the total amount of more than 10 trillion dollars.

The transition to an innovation strategy and the abandonment of the resource-based export policy is impeded by a whole range of factors:

- external demand for resources is high;
- domestic demand for resources, providing support for “long technological chains”, is limited due to the collapse of the processing and manufacturing industries' potential;
- efficient domestic technologies of resources processing are absent in many spheres;
- taxes and risks for processing and manufacturing industries are high;
- domestic innovation sphere is virtually non-competitive and is little involved in the economy modernization; and the developing domestic enterprises in the issues of modernization focus mainly on the import of technologies.

These factors are caused by the external environment and they are sustainably supported by the interests of many economic entities in the export of resources.

The export of resources should be linked with the development of domestic processing and manufacturing industries, and the appropriate ratio of exports to domestic consumption could be as follows: for resources extraction 1:3,

processing 1:2, manufacturing 1:1. Therefore, 3 out of 4 units of extracted resources should remain in the domestic economy, 2 out of 3 units of processed resources should be consumed within the country and for manufacturing industries – the half of produced goods should be exported.

It is shown that the preservation of a non-promising resource-based export strategy in Russia – in contrast to Norway, where the share of petroleum exports is even more significant – and the large-scale export of resources generate economic contradictions and social conflicts, which include:

- excessive gap between the incomes of the super rich and the poor (30 – 50-fold);
- short processing (without the finishing technological processes) and manufacturing technological chains (without the innovation component in the primary technologies);
- corruption increase;
- reduction in the quality, along with the increase in the cost of products and services (housing and public utilities, food, transportation, medicine) [1, 2].

***Prerequisites for the transition from the existing local to the large-scale economy modernization.*** The Programme for 2009 – 2011 states that policy directives and changes in legislation are unable to eliminate these reasons and contradictions. It is necessary to introduce radical systemic measures, for instance: new technologies, low taxes for processing and manufacturing industries, means and mechanisms of promoting demand and creating new technologies.

In order to gain the right to purchase new foreign technologies, it is necessary to have not only a sufficient amount of currency, but also the capacity for the successful development and subsequent maintenance of new technologies. In this respect, at least two conditions should be taken into account. Firstly, the companies-owners (the patent owners) of new technologies are not interested in selling them to the countries

with no appropriate professional personnel potential, because the poor development of technologies could damage the company's business reputation. Secondly, the companies-owners of new technologies form a kind of "club", the access to which is granted only if candidates have their own technologies and are ready to share and exchange them. The research of modernization prospects shows the inexpediency of restoring the idle production facilities due to the following reasons:

- the introduction of scattered innovations can ensure only minor improvements, slightly increasing the potential of the old, physically worn-out production facilities, besides, such innovations do not enable the swift raise in efficiency and competitiveness of technological chains;

- many idle production facilities, created in the former USSR, are inefficient and non-competitive;

- under market conditions it is inexpedient for Russia to copy the USSR strategy concerning the gradual restoration of old facilities;

- many sectors and sub-sectors have already passed the "point of no return" to a competitive level, and in their place it is necessary to create new companies and industries virtually from scratch.

In this respect, the Programme under development proposes a new approach to innovation industrialization, the goal of this approach is the creation of sub-sectors in a form of a network of connected competitive technologies in the following areas: machine-tool building, aircraft engineering, ship-building, heavy engineering, pharmacology, environmentally friendly foods, processing of industrial wastes, etc. The implementation of this approach is possible on the basis of construction management centralization in the framework of new modern holdings and the formation of innovation technological clusters and not on the basis of existing ministries and their structures.

Innovation and technology clusters should become the organizational basis for the formation of new industries and sub-industries and the initial development of new technologies should be carried out in the special economic zones. Given the technological backwardness of domestic innovation structures as compared to the world level, it is expedient to effect the initial large-scale import of technology, licenses and patents with their subsequent development and maintenance by means of domestic innovation potential.

***The combination of industrial and post-industrial development.*** The need for innovation industrialization is determined by the fact that the transition to post-industrial economy is impossible at such a low level of industrial production development that Russia possesses. The unprecedented decline (almost 2-fold to the 1990 level) of industrial production volumes by the mid-1990s in Russia was curbed at the beginning of the 21st century but the pace of their recovery, especially in manufacturing industries, lagged behind the growth rates of the economy as a whole, and in the recent years, due to the global financial crisis, it has slowed down. The decline in production affected not only high-tech sectors (rocket-and-space, electronic, aircraft and shipbuilding, pharmaceutical, instrument-making, etc.), but also medium-tech industries (machine-tool building, heavy transport and agricultural mechanical engineering, etc.). This has resulted in the present situation, when the transition to post-industrial society with a collapsed industrial base is either impossible, or it will only lead to the creation of an "advanced raw-material appendage" of the world economy.

However, the transition to post-industrial society, based on knowledge economy, modern information technologies and computers, should not be delayed. These two problems should be solved jointly. It is necessary to raise the level of medium- and low-tech sectors on the basis of innovations with the use of high-

tech industries' opportunities and potential. Only in these conditions it will be possible to move on from the almost disintegrated but restorable industrial potential to a post-industrial society.

When solving the problem of combining, i.e. recovering the lost industrial potential in the conditions of post-industrial development, it is necessary to take into account the negative experience of production automation in the former USSR, where automation and production of non-automated machine-tools, machines, manufacturing lines and other equipment was effected in the following sequence: first, non-automated products were produced, and then their automation was carried out. The latter did not become a compulsory part of modern production in the USSR, as a result, Russia was left with the significant amount of *enterprises and the whole branches with "manual control mode"*.

One should also take into account another historical experience, when the industrial potential of the USSR, lost during World War II, was restored on the pre-war technological base, which caused the strengthening of non-advanced technologies of the 2nd and 3rd technological modes. The essential goal of directing human and material resources to non-progressive technologies was to provide jobs for soldiers transferred to the reserve, but the restored, though still obsolete production facilities (mines, factories, transport vehicles, etc.) negatively affected the resource and energy intensity of domestic economy, and began to "burden" the industrial base in a subtle but consistent way. In the absence of competition, enterprises were forced to take (not purchase) the machines, equipment and material resources assigned to them in the framework of established funds. That's why at present, Russia's industrialization potential should be restored on the innovation basis oriented to the support of competitive technologies in processing and manufacturing branches.

Dynamics of innovation modernization of Russian economy in many respects will depend not only on the available innovation potential, but also on the quality of technological environment, in which innovation solutions are implemented. Technological environment is a particular case of organizational-economic environment, where economic entities, economic agents, entrepreneurs carry out their activities. According to the World Economic Forum data, Russia ranked 120th in 2010 – 2011 by the quality of organizational-economic environment and the level of favourable conditions for business. Such low quality is caused by the inefficiency of federal and regional laws, which frequently contradict each other. The set of rules and procedures, authorizing and supervising business, is accompanied by the high level of corruption and crime rate, etc. All this is aggravated by the inefficient observance of adopted laws, slow trials and partiality of legal judgments, attempts of forced illegal takeovers of property, etc. The improvement of the organizational-economic environment's quality was to a certain extent facilitated by the Decrees of RF Presidium and Resolutions of RF Government on reducing the number of tax inspections small and average business enterprises, simplifying the registration procedure for business enterprises and organizations, etc. However, these measures only partially improved the business climate and were unable to radically improve the environment for doing honest business.

It is noteworthy that Russian business itself does not yet possess the features typical of that in the developed countries, and it lacks the reliability of compliance with contractual obligations; strict observance of established standards and norms; compliance with established tariffs; transparency of financial flows; tax compliance, etc. Attempts of providing false information, gaining profit at the expense of consumers often become wide-scale, which causes the supply of low-quality

goods, medicines and food at excessive prices. These unpleasant activities are usually handled with the help of competition, the establishment of efficient standards, and efficient supervisory authorities. However, these measures do not work in the conditions of high corruption rate, lack of professionalism on the part of supervisory bodies, unjustified court decisions, etc.

It is impossible to improve the conditions for doing business by changing only one feature of organizational-economic environment. This requires systemic measures, implying a gradual, progressive improvement of the conditions for doing business based on the harmonization of interdependent characteristics of organizational-economic environment.

***Competitiveness is a crucial condition for innovation modernization.*** How can the competitiveness of Russian economy be increased? In theory, the answer to this difficult question is well-known: with the help of new technologies, the efficient innovation-based mechanisms of their development and implementation, as well as the active support of the demand for the products of these technologies.

However, it is not so easy to implement these essential conditions; Russia could pay a hefty price of wasting time and achieving nothing for “relying only on its own”, while many developed countries would advance far ahead. Therefore, Russia should carry out the following measures the sooner the better: 1) to import the advanced technologies in the strategically important industries of national economy (mechanical engineering, machine-tool building, electronics, oil processing, pharmaceutical industry, instrument making, etc.); 2) to work out the mechanisms for the rapid and full development of these technologies’ potential; 3) to introduce an obligatory innovation component, into the content of investment projects in order to support their development.

It is important not only to import new technologies (which was successfully done in the former USSR), but also to develop their potential comprehensively. This requires, along with the perseverance and consistent actions of authorities and business, the highly qualified personnel. Their shortage at present can be compensated by establishing the centres for personnel training and education in the field of advanced technologies in cooperation with leading domestic and foreign companies. Qualified personnel is one of the main conditions for attracting investments. Besides, it is necessary to establish research centres for support and maintenance of new technologies in the framework of their life cycle in cooperation with state-owned corporations. If organized properly, these centres can replace the branch-wise science disintegrated in the 1990s, and factory science existing earlier.

At that, it is necessary to take into account the possibility of importing technologies and production facilities in view of the prospects of reconstructing Russia’s competitive industrial base.

Of course, Russia, like many other developed countries, will not be able to establish competitive industries in all sectors. The branches subject to priority reconstruction should comprise [1, 3] investment mechanical engineering, including heavy, energy, transport, chemical engineering; construction materials sectors; pharmaceutical industry; electronics, instrument-making; communication and information systems, etc. However, after the inferential research and calculations, this list can be adjusted, since even many of the major developed countries don’t have a complete list of their own competitive industries, and the use of backward technologies ruins the country’s economy.

***Formation of the technological environment of a new quality.*** Production and sale of competitive products are impossible in the conditions of a non-competitive environment.

The important factors ensuring the development of market economy, exist in the mechanisms of competitive goods production and their free sales on the market. If the first condition is not realized in the domestic economy due to the accumulated long-term lagging of its technologies behind the world level, then the non-competitive environment is supported at the federal and regional levels by corrupt officials, crime, the inaction of law enforcement agencies and flaws in legislation. It would be difficult to “jump” from the 120th place up to the 20th in the ranking of countries according to the business environment attractiveness [2], because it requires a full and simultaneous replacement of entire parts in the system of state structure. It is expedient to accumulate and generalize the experience of rearranging the organizational-economic environment in the local conditions of new productions and technologies formation. At the same time it should be emphasized that entrance to the market and the initial development of new technologies should be strictly controlled by federal and regional bodies that haven't lost their purpose and professional qualities.

The significant drawback of domestic technological environment is the extremely slow cycle of decisions formation and adoption. For instance, in Russia one has to wait about 12 months to receive authorization for the construction of buildings and industrial facilities, this figure exceeds 6 times that of Kazakhstan and 10 times that of the U.S. According to expert estimates, the total duration of the decision-making cycle on the technological development issues at the federal level exceeds 6 months, while in the U.S. it does not exceed 1 month. It is noteworthy that after the adoption of decisions at the federal level, the time before the start of their implementation is stretched for more than 6 months, which is typical both of civil and military programmes, as well as of the financing of research projects by the federal funds: the Russian Humanitarian

Science Foundation, the Russian Foundation for Basic Research, etc.

At this stage of development it is necessary to provide active support of forecasts, strategies and programmes, to shape them professionally and to the highest standards, taking into account both domestic and foreign experience. While drafting development programmes, one should consider the links between the goals, expenses and time indicators of achieving the competitive level of new technologies and new products. The programmes should regard quality, cost and volume together and in coordination.

The planned industrialization of Russia may fail unless the financial mechanisms of ensuring investments sufficient for the scale of the set goal are created. In future it is planned to create large volumes of funding, which are concentrated in tangible and intangible assets and distributed among the enterprises of private, mixed and state ownership. These assets should serve as a tool for organizing the flow of capital in the emerging new sectors and sub-sectors. The efficient mechanisms of investment support should direct the created assets to modernization, and they should not be withdrawn under various pretexts to the budgets and funds. These assets should turn from the savings into accumulations and then into investments, supporting the next, new cycle of reproduction.

***Effective management of technological development.*** It should be admitted, that management quality and timeliness of decision-making at the state and corporate levels currently lags far behind the modern requirements of a dynamic market situation, which can often change unpredictably. The mechanism of forming the forecasts, strategies, programmes and projects should meet the present-day requirements. The legally established practice of forming the state order, especially when choosing innovation solutions and new technologies, is outdated and needs urgent revision.

The formation of long-term investments is impeded by high risks of their non-repayment, as well as the insufficient consideration of innovation component determining the competitive technology potential in methodological recommendations for estimating technologies' competitiveness potential.

Technological environment being an integral part of the organizational-economic environment should have a number of essential features, promoting business activities. They include:

1. Orientation of economic entities, implementing integrated technologies [1], toward the movement of products within the complete technological cycle: extraction of resources – production and processing in the form of machines, systems and facilities – their usage and the disposal of products that lost their consumer properties.

2. The chains of established technologies, called technological conversions, prolong the processes of intermediate products transfer (delivery), which are carried out with certain delays caused by the subjects of technological environment, who perform various control functions, including the tracking of products transfers between technological conversions.

3. High complexity of modern technological processes, especially in the manufacturing and processing industries, requires a high degree of synchronization in the delivery of raw materials and components and the processes of their transformation in the complex technology, the demand for which is initiated by the consumers and related technologies.

4. Synchronization of activities and comprehensive technologies maintenance is achieved through joint regulations and documents, having different purposes. These processes include a forecast, strategy, programme, plan, project, contract. Many of the documents should be coordinated between the subjects of technological environment, responsible for its regulation.

5. The business entities' interests, determined by their founders, and the various displaying of these interests in the functions and activities of the enterprises' managerial staff lead to different contradictions and conflicts, that can be resolved only with the participation of many subjects, regulating the technological environment.

The most striking examples proving the low quality of Russian business environment are the maintenance of the resource-based export strategy since the early 1990s and the decline in the domestic industrial production volumes. This generates short chains in the processing and manufacturing sectors. Of course, a limited set of conjugated technological conversions, effectively retained in the country by domestic economy, is influenced by the low potential of their competitiveness. So the absence of efficient technologies of oil processing, industrial methods of separation of propane, butane and ethane in the supplies of natural gas within the country and for export, the underdeveloped technologies of wood processing, etc., significantly reduce the added value of raw materials exported by Russia, as the profitability of the final conversions in the petroleum and gas chemistry and wood processing industry in the leading countries is several times greater than the profitability of primary conversions, which production is exported by Russia.

Most of the regularities, adopted in social sciences, market economy and democratic society reflect the results of activities of the existing mechanisms of economic subjects' interaction. These mechanisms are the rules of relations between entities, based on mutual agreements, mutual concessions and compromises. Many of the mechanisms reflect the rules of rational choice, Pareto efficiency principle and others adopted in economics. In the Russian market economy, formed less than 20 years ago, the transfer of the capital to private hands pursued political goals, the

collapse of the socialist state foundations, and was held in the conditions of chaos, absence of the fair rules of state property distribution, that was created by the efforts of many generations. The illegitimacy of state property distribution in the 1990s is still an obstacle to mutual agreement between the different layers and groups of society, which significantly hampers the harmonization of relations in the economy and society.

In the conditions of limited financial resources in the country, when forming the credit policy, one should take into account not only the strategic importance of reconstructed industries, but also the quality of their reconstruction management. Traditional methods of development management and the programmes, worked out by a simple “summing up” of proposals without a strategic plan and orientation at a level competitive in the world markets, should not be funded and supported. In the initial stages it is more important to abandon investment proposals lacking the innovation potential, than suffer losses from the production of obsolete products and technologies useless for modern economy.

It is necessary to carry out a consistent search for the harmony of technological environment characteristics, which would be favourable for business. For Russia the ratios of separate parameters of this environment, sustainable in their dynamics, are unknown beforehand. Their values are determined not so much by considering the similar ratios in the developed countries, as by regular forecasting, modeling, analytical calculations and research.

**Absorbing the new technologies.** At present, among many acute problems hindering the innovation development, the issue of absorbing innovation solutions by Russian economy is the most important one. Its promotion requires the following:

- enterprises should not only have a development strategy (which is useless without absorbing innovation technologies and solutions), but also the annually approved plan

(programme) for the specific measures on the adopted strategies implementation;

- regular assessments of the impact of developed innovation technologies and solutions on the enterprises' economy should be carried out, including the analysis of the changes in the volumes of released production, its quality, self-cost and price;

- value of tangible and intangible assets of an enterprise should be regularly assessed, the change of which should be influenced by implemented innovation solutions, as well as external conditions reflecting the dynamics of the market situation.

The absence of competitive domestic technologies is not the only factor facilitating short processing chains. Numerous endorsements for gaining authorization for business activity significantly increase the risks in the final stages of resources processing, which contributes to the fact that companies abandon their development, and they export non-processed resources. It is not mere chance that the transition of Russian companies to the production of motor fuels that meet Euro-3, Euro-4 and Euro-5 standards is delayed for many years, and the adopted projects for oil refineries reconstruction went significantly beyond the agreed deadlines and cost estimates.

***The structure of the RAS Presidium Programme “Forecast of Russia's Innovation Industrialization Potential”.*** The main sections of the new programme on inferential research are as follows:

1. Conditions of Russia's socio-economic development for a medium- and long-term perspective.

2. Conceptual, strategic decisions, providing innovation-based industrialization.

3. Main outlines of the innovation industrialization state regulation mechanism.

4. Concept and model of an innovation-active enterprise.

5. Prospects of forming the organizational-economic environment favourable for innovation industrialization.

6. State and prospects of Russia's innovation potential development.

7. Promising structural and technological changes in resource-extraction, processing, and manufacturing industries.

8. Opportunities for creating promising sub-sectors and production facilities on the basis of technologies import.

9. Analysis of a condition and development prospects of small and medium-sized enterprises, including small innovation enterprises.

10. Foreign experience of industrial and post-industrial development.

11. Conditions and organizational forms of training qualified personnel for new technologies maintenance.

12. Perspective development directions of fundamental and exploratory research (region-wise).

13. Promising areas of applied advanced R&D.

14. Patterns of technological development of the economy, including structural changes in Russia's economy in the framework of the 5th technological order, as well as advanced technologies of the 4th technological order.

Innovation industrialization of Russia is promoted, in particular by the following factors and conditions:

1. Under the "reset" of Russia – U.S. relations it is necessary to secure the repeal of the Jackson-Vanik amendment concerning the delivery of advanced technologies to Russia.

2. In the framework of international agreements it is necessary to get the U.S. abandon the monopoly on advanced technology, which allows the U.S. to control the technological leadership.

3. In order to mitigate the growing contradictions and conflicts with developing countries, industrialized countries shouldn't impose "democratic values" and they should supply advanced technologies on favourable terms.

4. Innovation industrialization financing sources can be found in the newly created assets, extra-budgetary funds, industrial gold loan, funds and assets of the USSR, located in other countries, etc.

5. If Russia has become an "integral part of the world economy" [2], it has the right to suggest that the countries-importers pay for the supplied resources not only in cash, but also by supplying new technologies on their part. Under the conditions of the global crisis, orders for such supplies can provide substantial support to their economy.

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