The Tasks of Digital Transformation and Ensuring Technological Sovereignty of Russia in the Context of Economic Sanctions

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Abstract: The study is devoted to the development of a scenario for the digital transformation of the Russian economy, taking into account the prolongation of Western sanctions for an indefinite period. The object of the study is the mechanism for ensuring Russia's technological sovereignty. The subject of the study is a set of organizational and economic relations arising in the process of digital transformation.

1 INTRODUCTION

In recent decades, the most important factor in ensuring sustainable economic growth and increasing the competitiveness of the national economy has been the acceleration of scientific and technological progress based on innovative development of production, the widespread use of information and communication technologies (ICT), digitalization and digitalization of economic and managerial processes. Today, digital technologies based on ICT are being introduced into almost all areas of human activity and economic processes occurring both at the level of enterprises and industries, and at the macro level, reformatting regional and global markets, forming new sectors of the economy and infrastructure sectors, and creating fundamentally different forms of communication between elements of socio-economic systems at various levels, including the global sector of the economy.

However, today, in the context of the transformation of the global dynamic geopolitical and socio-economic system that the modern world represents, innovative economic development and digitalization are not just areas of economic development and factors in increasing labor productivity, ensuring a higher level and better quality of life for the population, but also ensure the technological sovereignty of the country, and ultimately its economic and national security.

For Russia, which has been under unprecedented sanctions pressure from Western countries for the past ten years, the tasks of ensuring technological sovereignty based on innovative development and digital transformation are of existential significance. The confrontation between Russia and the West, which has intensified many times since the start of the Special Military Operation in February 2022, has been expressed, in particular, in the multiple tightening of restrictions on the supply of high-tech products to Russia, attempts to exclude the country from traditional global technological chains, the withdrawal of a number of high-tech foreign companies from the Russian market, which has limited Russia's access to global markets for high-tech products and complicated the possibilities of high-tech transfer as one of the conditions for a technological breakthrough.

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The anti-crisis measures adopted by the Russian Government, on the one hand, and the eight-year experience of the Russian economy functioning under economic sanctions and import substitution, on the other, have made it possible to soften the severity of the restrictions imposed by Western countries and even became a source of new opportunities for the Russian business sector. In particular, a number of measures were taken to support the development of the digital sector; starting in 2014, import substitution strategies were actively implemented in the electronics industry. Nevertheless, the uncertainty of the situation with the prolongation of sanctions for a long period and their possible further tightening not only in relation to Russia, but also to friendly countries with which it currently carries out international cooperation, including in the field of high technology, poses the task of promptly creating its own technological base in critically important areas, digital transformation and the use of digital technologies for the development of the national economy and solving strategic problems.

This determines the relevance of studying the problem of ensuring Russia's technological sovereignty in the context of economic sanctions and determining priority areas for the digital transformation of its economy.

2 RESEARCH METHODOLOGY

According to the world-systems approach of Immanuel Wallerstein (Wallerstein, 2006), later developed by a number of foreign (Amin, 1990, Frank, 1966) and Russian researchers (Abdulov, 2022, Dzarasov, 2014, Shkodinsky, 2022, etc.), the world economy of the late 20th – early 21st centuries could be represented as a complex dynamic system, heterogeneous in its structure and including three large subsystems:

1. The center, represented by the leading countries of the world economy (initially the USA, Western European countries and Japan, later Japan, whose economic growth rates slowed down, shifted to the upper borders of the Semi-periphery, and the EU actually fell into complete economic and political dependence on the interests of the USA). These countries were considered as subjects of globalization, benefiting from this process and capable of directing it into the channel of their national interests.

2. The semi-periphery, which has a complex structure and also includes countries with heterogeneous levels of economic development, including those with transition economies (former socialist countries), growing markets, newly industrialized countries, and other states from among developing countries with relatively high and medium levels of development. These countries are traditionally considered as subjects-objects of globalization, which, along with the benefits of increasing interdependence within the framework of the development of its processes, experience certain problems caused by the contradiction between their national interests and the tendencies of the development of globalization processes in line with the interests of the Center.

3. The periphery - the poor and poorest countries of Asia and Africa or the Deep South, effectively excluded from the orbit of globalization due to their underdevelopment and inability to offer the world market anything more significant than agricultural raw materials, as a result of which they were generally viewed as objects of globalization.

This model of globalization, which has been in effect for the last three decades, has in fact been a unipolar world, built on the principles of unequal exchange between countries belonging to different levels of the world system hierarchy. In particular, this was expressed in a significant excess of the price of production over the cost of goods sold in the countries of the Center, while the prices of peripheral production, on the contrary, were significantly lower than the cost.

In the conditions of the world-system that emerged at the turn of the last and current centuries, the global Center took a monopoly position in the high-tech goods market, having effectively secured the right of ownership of advanced science-intensive production, which, combined with the possession of global financial markets, allowed the United States and its satellites to exploit the Semi-periphery and Periphery (Amin, 2012), using the concept of "implantation of backwardness" (Frank, 1966). The latter, in particular, was implemented in the 90s of the twentieth century in Russia through the International Monetary Fund and other global institutions, which the Russian Federation joined in the first years of market transformation. The concept of "implantation of backwardness", on the one hand, presupposes the transformation of the productive forces of the country of its application into a more primitive single-industry form, necessary for pumping resources to the countries of the Center, which for Russia should have been expressed in the conservation of the raw materials orientation of its production and export. On the other hand, the "imposition of backwardness" transforms production relations through the

formation of a comprador bourgeois elite while simultaneously pauperizing the population.

The implementation of this concept during the period of economic liberalization in Russia in the 90s of the last century resulted in the deindustrialization of the country's economy and its technological degradation, which determined its resistance to innovation (Dzarasov, 2014). Overcoming this scenario, which involves modernizing the economy and achieving technological sovereignty, is likely to be quite difficult in the context of a unipolar world-system model, but seems possible in the context of the world-system transformation that is currently taking place. The contradictions accumulated by the world-system over the past decades have now brought it to a bifurcation point preceding the system's acquisition of a new configuration, restructuring and the formation of new inter-element connections. (Mironova, Boev, Bogdanova, Ermoolenko, Yaroshenko, 2020). In the context of a multipolar world, the countries of the former Semi-periphery. Including Russia, there is an opportunity for a technological breakthrough, digital transformation and achievement of technological sovereignty while maintaining and even tightening sanctions from Western countries that are losing their leading position in the transforming world system.

All of the above determined the use of both general scientific methods of cognition, such as the dialectical method, analysis, synthesis, abstraction, deduction, induction, analogy method, etc., and specific scientific methods of studying socio-economic reality, including systemic-structural and specific historical methods, as a methodological basis for the study.

3 RESEARCH RESULTS

For Russia, in the context of the current external challenges, achieving technological sovereignty is seen, first of all, on the path to overcoming import dependence in the high-tech sector of the economy and using its own resources to implement digital transformation. According to a number of authors (Ganichev N.A., Koshovets, 2020), this is not possible in the context of the neoliberal model of globalization with a unipolar world order and requires Russia to "de-link", i.e. disconnect from the center-periphery world system, consider the development priority of orientation towards the domestic market and implement digital transformation based on its own available reserves (Abdulov, 2022). This does not mean autarky, which is no longer possible at the current level of development of the world economy and international economic relations, but presupposes the switching of the entire complex of international political, economic and scientific-technical relations to countries with similar national interests.

Something similar, thanks to the unprecedented tightening of Western sanctions, is happening now. Russia is reorienting cooperation in all fundamentally important areas to friendly countries, minimizing contacts with former Western partners and, de jure remaining a participant in the IMF and other international economic organizations, de facto forming prototypes of new international institutions together with partners from friendly countries.

At the same time, a transformation of the world-system itself is taking place, entering a state of bifurcation, in which, despite the attempts of the countries of the Center to maintain their status quo , the contours of a new world order with several poles are already emerging, the exact number of which remains uncertain. (Mironova, 2022)

In the current conditions, two polar (extreme) scenarios of digital transformation can be imagined, which can be conventionally called optimistic and pessimistic, based on the possibilities of implementing a technological breakthrough by increasing our own developments at the expense of internal reserves and the existing scientific, technical and technological base, as well as technology transfer, which is currently one of the most important conditions for overcoming the technological gap with the leading countries. At the same time, the demand for digital technologies from national industries and enterprises is of great importance. (Dorzhieva, Ilyina, 2021)

These scenarios are linked to the scenarios of the development of the macroeconomic situation, which is considered in the planes of the impact of two main factors: the economic situation on the world market and the degree of severity and impact of sanctions on the national economy of Russia. In turn, the situation in the world economy can vary from economic growth and stability to stagnation, recession and even a long series of crises, and the severity of sanctions can change within a scale with extreme values from the complete lifting of sanctions to their maximum tightening, leading to the complete isolation of the country (Table 1).

Table 1: Polar scenarios of digital transformation in Russia under the conditions of Western economic sanctions (Rudnik, Zinina, 2024).

	Factor 2 Impact of sanctions

Factors of macroeconomic scenarios	Easing/lifting of sanctions	Tightening sanctions/international isolation
economic growth/economic stability	Optimistic scenario of digital transformation: - restoration of investment activity and demand for digital technologies; - availability of technology transfer; - rapid growth of our own developments and production of digital products	
Factor 1 The economic situation in the world economic downturn / economic crisis		Pessimistic scenario of digital transformation: - decline in investment activity and demand for digital technologies; - inaccessibility of technology transfer; -slow growth of in-house developments in digital product manufacturing

In reality, it can be assumed that the development of events will develop in line with the optimistic and pessimistic scenarios in the next few years, which suggests choosing a medium-term perspective as the forecast horizon at least until 2030. In all likelihood, during this period , there will be no significant easing of Western sanctions, and economic ties and scientific and technical cooperation with Western countries will either continue to be curtailed or will be restored at a slow pace.

Nevertheless, the stabilization of Russia's international economic relations and its reintegration into global technological chains will occur, but with new partners from friendly countries and under new conditions, which will allow modernization of high-tech industries by importing equipment and technologies from these countries and developing domestic production of science-intensive products through domestic research and development, gradually increasing import substitution in these sectors of the economy. The rate of economic growth in such a scenario can be predicted from 2-2.5% per year and higher. In such a scenario, economic growth will inspire demand for innovations among domestic manufacturing companies, and the development of relations with foreign partners will entail an increase in exports, which, in turn, will also serve as a trigger for innovative development of export-oriented companies interested in the compliance of their products with international quality standards.

Thus, focusing on the growing domestic market and integrating into global technological and production chains with new partners will stimulate the interest of domestic manufacturing companies in investing in digitalization and modernization of their production, allowing them to increase their competitiveness.

It is important to note that cooperation with friendly countries in the production of high-tech products and import substitution in domestic high-tech industries are not considered interchangeable, but complementary processes. That is, the process of digital transformation of the Russian economy should have two components: domestic, associated with its own developments and an existing research base, and international, conditioned by relations of scientific and technical cooperation and technology transfer, which complement and mutually stimulate each other. This is due to the fact that in the current conditions of the international division of labor, the production of ICT goods by one country "from scratch" is not possible, since it is associated with the import of the necessary equipment and components. The development of domestic software, as well as computing and telecom equipment, can have a more pronounced independence from imports.

The implementation of such a digital transformation scenario will allow Russian manufacturers to develop digital technologies not in isolation from global market trends, but in the context of international competition, which remains quite intense in the ICT products market. This creates conditions for maintaining high quality digital technologies, products and services, which will not only help strengthen Russia's technological sovereignty and, accordingly, increase its economic and national security, but will also ensure the necessary level of competitiveness and digital parity with Western countries both in the context of

prolongation of sanctions and after their probable lifting or mitigation in the long term.

4 DISCUSSION OF RESULTS

Economic sanctions currently applied by Western countries against Russia are a fairly common instrument of international policy, used by leading countries against states whose policies are pursued in a direction different from their strategic interests. In most cases, sanctions are applied against specific government officials, representatives of big business, companies, industries or nation states, but at the same time significantly worsen the economic situation of the country, the conditions of its international trade, the state of its national currency, which ultimately leads to a decrease in the standard of living of its population, that is, citizens who are not involved in political decision-making (Beloshitskpaya, 2024).

For Russia, the sanctions imposed by the Central Asian countries (primarily the US and the EU) in 2014 were not something fundamentally new, since the USSR, whose legal successor was the Russian Federation, existed under fairly strict restrictions almost from the first years of its creation until its collapse. However, after the start of the Special Military Operation in Ukraine, the number of sanctions increased many times over, their depth and severity of impact on the Russian economy increased. Thus, only for the period from 2022 to 2023, 8 packages of sanctions were imposed on the Russian Federation, the fourteenth package of sanctions is currently in effect, and it is expected that 2 more packages will be adopted by the end of 2024. The total number of sanctions against Russian individuals and legal entities exceeds 21 thousand, which has no analogues in modern history.

Analyzing the impact of sanctions on the Russian digital technology and digital products market, it should be noted that in recent years, the supply on it has been formed by two sources: ICT imports and domestic companies' own ICT developments, including those created on the basis of technology transfer. On the eve of the start of the SVO in 2021, the gross added value of the domestic digital sector amounted to RUB 3,729 billion, the lion's share of which (RUB 2,019 billion or 54%) came from software and IT services, which form the "core" of the sector, another 28% (RUB 1,060 billion) from telecom services and 10% (RUB 381 billion) from the production of ICT goods (including equipment and microelectronics). The remaining 7% or RUB 269 billion of added value was formed in the wholesale ICT trade. The volume of imports amounted to 2,582 billion rubles, its structure was dominated by such goods as computing equipment, servers, laptops, smartphones and other digital consumer goods. (Ganichev N.A., Koshovets, 2021) Thus, the import substitution policy pursued by the state since 2014 has yielded a certain result, consisting in the predominance of domestically produced ICT products over the import of goods from digital industries, but this excess is generally insufficient to state that our country has achieved full technological sovereignty. In addition, the growth rates of ICT imports in Russia exceeded the growth rates of domestically produced ICT products.

At the moment, one of the serious problems is that the Russian high-tech sector relies mainly on foreign equipment and technologies, and the bulk of the profits of wholesale distributors is generated thanks to ICT imports. Thus, despite the fact that the Russian digital sector met the tightening of sanctions in 2022 with generally positive results, Russia has not yet been able to completely overcome its dependence on imports in the field of digital technologies.

The limited supply of Western high-tech products was compensated for by parallel imports, as well as by intermediary trade, which in many cases is used by the US and EU suppliers themselves. In particular, this is how German computer-controlled machines Heller and Fein GmbH are supplied to Russia, which the manufacturers themselves sell to our country through Turkish intermediaries. This situation is due to the fact that the sanctions have had a double-edged effect on the economies of the countries that introduced them, where national IT companies are suffering significant losses after the ban on trade with Russian partners, which has become traditional for them.

It should also be noted that in 2022, a number of leading global ICT companies left the Russian market almost simultaneously, in particular, Microsoft, Oracle, Cisco, IBM, Adobe, Acronis, Arbor (Netscout), Atlassian (Jira), Autodesk, Avast, AWS, Canonical, Coursera and others. (Khvatov, 2023) The number of Western partners working with domestic IT manufacturers has sharply decreased, which has reduced Russia's export opportunities in the digital sector of the economy.

Thus, the impact of sanctions on the domestic ICT sector is dual, and their introduction and tightening entailed significant changes both for manufacturers of digital technologies and products, and for industries and companies indirectly interacting with the ICT sector, which were forced to adapt to the new conditions and develop their own analogues of

Western prototypes or switch to domestic substitutes. Such a transition did not lead to significant shocks for consumers due to the import substitution policy pursued since 2014, which resulted in the development of alternative products, which, in particular, include Astra Linux - the first domestic operating system, AlterOS, Alt Linux, ROSA Linux. In addition, an alternative to the Microsoft Office software package has been developed - AlterOffice (Khvatov, 2023).

However, despite the positive results noted, there are a number of problems in Russia that currently prevent us from talking about the country achieving technological sovereignty and the ability to maintain it over a long period in the context of prolongation of sanctions. These include:

- the initial level of technological lag of Russia from the countries of the Center in the sphere of digital technologies: on the eve of the beginning of the CEE, Russia was in the fifth ten (45th place) in the world ranking of countries by the size of the ICT index;
- catch-up development of the Russian ICT sphere, which to date does not have a serious status in the global market, the absence of domestic brands with a global name in this sphere;
- insufficiently high growth rates of domestic production and the market for digital technologies and products;
- insufficient quality of domestic digital products compared to foreign analogues, their low competitiveness in the global market;
- the need to ensure a high level of qualification of IT specialists, which requires systemic changes in the issues of their training, improvement of the system of secondary vocational and higher education in Russia, advanced training and professional retraining of personnel;
- the outflow of a significant number of highly qualified IT personnel abroad after 2022, as well as the transition of a number of IT companies that previously operated in Russia to the jurisdiction of other states with a more favorable tax regime and other business conditions.

The solution to the above-mentioned and other problems related to digital transformation and ensuring Russia's technological sovereignty under sanctions requires a systematic approach and at least a medium-term perspective. The tasks facing our country to accelerate the pace of innovative development and the introduction of digital technologies in all areas of economic activity must be comprehensively addressed at the level of the state and regions, as well as industries and enterprises, which requires the formation of effective interaction at the level of elements of national and regional innovation systems, the development of the necessary infrastructure adequate to modern challenges, and the use of modern methods of managing innovation processes.

5 CONCLUSION

Summing up the results of the conducted research, it should be noted that despite the fairly successful resistance of the Russian economy to the sanctions pressure on it over the past ten years, of which the greatest severity of restrictions occurred in the period 2022-2024, the tasks of ensuring technological sovereignty and digital transformation of the economy are still relevant for the country and are of an existential nature in the context of the global transformation that the world-system is currently experiencing. Ensuring a worthy meta for Russia in the emerging model of a multipolar world will be determined, among other things, by the level of its technological development. It can be confidently stated that the appearance of the Russian economy in the contours of the new world will be determined by the scale and effectiveness of the implementation of digital technologies.

Since the transformation of the world system may last for an indefinite period of time, it should be assumed that anti-Russian sanctions will remain relevant for our country for at least the medium term. In these conditions, the possibilities of digital transformation for Russia will be determined not only by the ability of the national economy to adapt to their potential tightening over a long period of time, but also by how quickly and effectively the tasks of realizing its own scientific and technical potential and the possibility of its effective application in digital industries will be solved, the development of which will remain a global trend regardless of which model of the world system is formed after it exits the bifurcation point.

According to the authors, further development of the Russian economy will be in the space of options between the optimistic and pessimistic scenarios and we will assume the interaction of import substitution strategies in the industries of the domestic ICT sector and the development of scientific and technical cooperation with friendly countries with the formation of new global technological chains and mutually beneficial technology transfer, allowing Russia to both compensate for the loss of Western partners in those areas where import substitution by

its own efforts is impossible under the current conditions, and to develop export-oriented ICT production entering the world market with competitive products. All this will contribute to the achievement of technological sovereignty of the country and ensuring the necessary level of its national and economic security.

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