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Import Substitution as a Factor in the Development of Domestic Digital Technology

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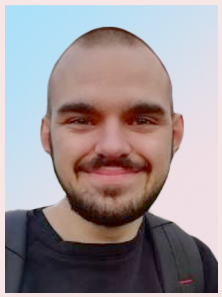

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Abstract. According to global economic development trends, digital technology is a necessary factor in increasing competitiveness, labor productivity, reducing resource costs and optimizing business processes. In Russia, its development is one of the factors that drive the economy. As a result of the changing geopolitical situation, large foreign companies operating in the field of digitalization have begun to withdraw from the Russian market since 2022. This has brought to the fore the problem of import substitution (development of own digital and information technology) at the state and corporate level. Addressing the issue of import substitution will not only reduce imports, but also increase the production of high-tech goods and support domestic producers. In this regard, the aim of the study is to identify barriers to and opportunities for import substitution of digital technology in Russia. Based on the systematization and review of scientific works in the field of import substitution, we highlight approaches to its implementation. The article substantiates the need to implement the third approach in the context of Russian reality. We analyze the volume of high-tech exports of Russia as compared to other countries. We assess the high-tech export trajectory pursued by constituent entities of the Russian Federation in the context of commodity groups that promote digitalization. We highlight trends and problems of import substitution in the field of digitalization and investigate support measures and state policy aimed at import substitution in the field of digital technology and developments. As a result of the research, we have designed a toolkit to support the development of domestic digital technology based on import substitution. Using the toolkit helps to present the contribution of economic entities and its specifics in the field of information technology. Proposals have been prepared for the formation of an import substitution strategy in the field of digital technology, taking into account industry specifics. The results of the study can be applied by the state authorities of constituent entities of the Russian Federation in the field of digitalization.

Key words: import substitution, domestic developments, digital technology, development, territories.

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Introduction

The rapid pace of scientific and technological progress in the world dictates the need to change the economic management principles. One of the most pressing global trends in current economic development is digital transformation. The Second Johannesburg Declaration, adopted at the BRICS Summit in 2023, outlines "the active role of the digital economy in promoting global economic growth"[1], as well as the role of digitalization in education and culture in the BRICS countries.

The digital transformation process in Russia is regulated primarily by the Presidential Decree "On the National Development Goals of the Russian Federation for the period until 2030"[2], which establishes the achievement of "digital maturity" of key sectors of the economy and social sphere, including healthcare and education, as well as public administration. At the same time, the growth of investments in domestic information technologies up to 2030 is four times compared to the value

[1] The Second Johannesburg Declaration. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://d-russia.ru/wp-content/uploads/2023/08/bricsdeclaration-2023.pdf

[2] Decree on Russia's National Development Goals until 2030. Available at: http://www.kremlin.ru/events/president/news/63728

of the indicator in 2019. In addition, since 2019, the national project "Digital Economy"[3] is being implemented in the country, aimed at creating and supporting information infrastructure, as well as the introduction of digital technologies in production and public administration. Another document regulating digital transformation is the Information Society Development Strategy in the Russian Federation for the period 2017–2030.

The increasing relevance of issues related to digitalization is also due to the need to solve the problem of import substitution in a deteriorating external environment, namely the application of sanctions by the world's leading economies (Europe, the United States, Canada, Australia) against the Russian Federation. It is against the background of fierce competition and external restrictions that import substitution opportunities in the field of digital technologies should be activated not only at the country but also at the regional level.

The introduction and further use of digital technologies play a key role in ensuring digital transformation. Hereinafter in the study, digital technologies are understood as technologies for collecting, storing, processing, retrieving, transmitting and presenting data in electronic form.

Digital transformation is also being implemented at the regional level. By September 2021, all constituent entities of the Russian Federation have approved regional strategies for digital transformation of key economic sectors, social sphere, and public administration in fulfillment of point 2 of the RF President's list of instructions Pr-2242, dated December 31, 2020[4].

Implementation of digital transformation can occur both through the import of digital technologies and through the introduction and use of digital technologies created in Russia. The development of Russian digital technologies has a number of advantages:

– first, it allows solving the issue of information security;

– second, it ensures economic independence from foreign counterparties;

– third, it contributes to creating a new industry.

At the same time, the development of digital technologies only through import substitution processes may be associated with some negative effects, namely the emergence of artificial restrictions on the market. It is about the lack of necessary assortment and other offers, the possibility of choice, which in the end can contribute to the formation of coping strategies in the field of digital technologies[5].

Import substitution and digital sovereignty began to influence the IT market in Russia in 2022 and 2023. Before that, most Russian enterprises used foreign technologies and services, making the transition to Russian hardware and software a priority. The departure of the majority of large suppliers of information technologies and equipment from the Russian market has led to the need to develop domestic developments and increase investment in this industry. Moreover, the driver for developing own products in the field of information technology was not only the demand from business, which was deprived of the opportunity to choose an IT product, but also the government, which demanded the development of Russian software for the needs of official structures.

[3] Digital economy of the Russian Federation. Available at: https://digital.gov.ru/ru/activity/directions/858/

[4] List of instructions of the President of the Russian Federation, dated December 31, 2020. Available at: http://www.kremlin.ru/acts/assignments/orders/64859/print

[5] Suppression of competing activities.

It is crucial to identify the most promising areas of import substitution of digital technologies and concentrate the available financial resources on them in such conditions (Zimovets, Klimachev, 2022; Glaziev, Tkachuk, 2023; Krylova, 2023).

In this regard, the aim of the research is to identify barriers and opportunities for import substitution of digital technologies in Russia. We solve the following tasks to achieve the aim:

1) to analyze Russian experience concerning the development of import substitution of digital technologies;

2) to summarize promising areas of import substitution of digital technologies in Russia;

3) to identify trends and problems of import substitution in the sphere of digital transformation and information technologies, which have an impact on the development of digital technologies;

4) to identify priority areas of support in the sphere of information technologies and features of implementation of the state import substitution policy to develop digital technologies and applications.

The hypothesis of the study is the assumption that the development of digital technologies is possible through the import substitution policy, which is implemented on the basis of stimulating the production of competitive high-tech world-class goods in the country and regions, which can help to create new and develop the existing high-tech industry areas in the digital economy.

Theoretical aspects of the research

Our study considers import substitution as a certain economic strategy, the main goal of which is to protect domestic producers by replacing imported industrial goods, services and technologies with domestically produced products. The aim of implementing import substitution processes is to increase the competitiveness of domestically produced goods. This aim is achieved by stimulating business modernization processes and increasing the productivity of enterprises. In addition, it is important to create and implement fundamentally new technologies for the production of products with high added value (Bereznev, Kulpina, 2022; Borobov, Mindlin, 2022; Mo et al., 2021).

Russian academic economists divide the import substitution policy into three directions. The first direction is to increase the volume of domestic finished goods and services sold in the Russian market by reducing or slowing down the growth of sales of similar imported products (Gulin et al., 2015; Gotovskii, 2021; Abdikeev, 2022; Irwin, 2021; Zhang et al., 2023). The implementation of this direction involves the development of new types of products; improving the competitiveness of products manufactured in the country; increasing domestic production; and stimulating food production in the conditions of counter-sanctions (Gotovskii, 2021; Glaziev, 2022; Glaziev, Tkachuk, 2023).

The second direction is associated with increasing the share of components, raw materials and materials produced in the Russian Federation in the structure of output products for the subsequent production of domestic products based on them, as well as with stimulating demand for them. In addition, it consists in stimulating demand for such goods (Gotovskii, 2021; Gulin et al., 2015; Zimovets, Klimachev, 2022). This direction includes accommodation related to operations of technological nature; replacement of raw materials and materials of imported origin with domestic analogs; deepening of industrial cooperation (Boldina et al., 2022; Borobov, Mindlin, 2022; Rudenko et al., 2022; Khomenko et al., 2022; Bottega, Romero, 2021).

The third direction includes the so-called export-oriented import substitution. It is based on the active promotion of import substitution measures, in which products characterized by

greater localization are sold in both Russian and foreign markets, i.e. simultaneously sold domestically and exported (Gulin et al., 2015; Gotovskii, 2021; Lenchuk, 2022; Makarycheva, 2022; Krylova, 2023; Zhou, Fan, 2023). At the same time, an additional effect is achieved for the Russian economy as a whole due to increased localization and higher added value created by enterprises. This may contribute to economic growth and allow overcoming the low dynamics of external demand (Abdikeev, 2022; Gotovskii, 2021; Zimovets, Klimachev, 2022; Krivenko, Epaneshnikova, 2020; Rodrigues, 2010; Carrasco, Tovar-García, 2021).

In a number of scientific works, the issues of development of import substitution of the high-tech sector and digital technologies in Russia in the new economic conditions include the following points:

– the state relies on technological sovereignty under external pressure, i.e. the introduction and replication of Russian technologies and their use in the creation of new industrial enterprises and serial production (Abdikeev, 2022; Glaziev, 2022; Lymar et al., 2022); in this case, it is not only about import substitution, but also about the production of competitive products compared to Western analogues (Gulin et al., 2015; Dubkov, Noskov, 2022; Zimovets, Klimachev, 2022);

– it is emphasized that success in achieving technological sovereignty largely depends on the support of small and medium-sized high-tech companies, as well as on the availability of financing for them (Boldina et al., 2022; Borobov, Mindlin, 2022; Khomenko et al, 2022); however, it is worth noting that the venture capital market in Russia is still at an early stage of development, and further breakthroughs require the support of the state, which will assume the risks (Kuznetsova, Tsedilin, 2019; Makarycheva, 2022; Shavtikova et al., 2022; Menon, 2023);

– it is argued that the need for large-scale import substitution in many industries is a condition for providing project finance for twenty years (Lenchuk, 2022; Makarycheva, 2022; Glaziev, Tkachuk, 2023; Meral, 2021). This is one of the key needs of most major investors. It is worth noting that additional changes to the "project finance factory"[6] mechanism will contribute to increasing the role of this instrument in Russia's economic recovery in the coming years (Bereznev, Kulpina, 2022; Glaziev, 2022; Sycheva, 2022).

The development of own digital technologies plays a key role for technological change in the country (drawing on the research of the W. Jia, A. Collins, W. Liu, A. Goldfarb, C. Tucker, academician S.Yu. Glaziev, etc.). The process of miniaturization, with microchips replacing entire machines, means that more and more digital technologies and developments are required to drive the digital economic transformation (Glaziev, 2022; Jia et al., 2023; Goldfarb, Tucker, 2019).

The development of the technological conjuncture of world exports and the inclusion of countries in high-tech markets is based on long-term benefits. For instance, one of the indicators for assessing the competitiveness of technological civilian products in the export market is the "share of high-tech exports in the world" (Zhou, 2008; Reinert, 2020; Irwin, 2021; Matthess, Kunkel, 2020). Countries, by developing their high-tech specialization, can increase the productivity of available resources and thus increase the volume of technological products produced, forming long value chains (Bon, 2021). At the same time, technological exports should be understood not only as analytical groups of civilian goods, but also as the system of interconnectedness of building long value chains

[6] Financing of investment projects in priority domestic economic sectors.

based on the model of "strategic alliances" (Harris, Schmitt, 2020; Cooke, Watson, 2011). The category of "high-tech" includes technically complex products, for the production of which complex technological processes (advanced technologies) are used, based on the results of not only applied but also fundamental scientific research (Oviatt, McDougall, 1994; Bruton, 1998; Sestu et al., 2018;).

Consequently, the reviewed scientific studies allow highlighting the following characteristics of import substitution:

1) a forced process to prevent economic decline in the context of tightening external restrictions in order to develop own goods (similar to foreign ones) and partly to develop and produce new products in the high-tech sphere, including digital technologies;

2) a necessary stage and basic component of a country's technological sovereignty, related to the development and implementation of its own digital technologies to create a domestic sector capable of fully satisfying the needs of the domestic market;

3) a catalyst for creating of new industries and sectors for the development and production of digital technologies that will be used to solve domestic problems and have a competitive advantage in the foreign market;

4) it is also worth paying attention to the fact that under the existing conditions, specific products and services are needed for Russia's technological sovereignty and structural adaptation of its economy, including digital products and technologies, underdeveloped in Russia.

Research methods

We used the integrated approach principles as a methodological basis of the research. The solution of the research tasks was based on the analytical review of modern scientific and technical, regulatory, methodological literature, touching upon the research problem.

The information base is the works of Russian and foreign scientists, statistical data and analytical studies, normative-legal acts of public authorities and management bodies, as well as materials of periodicals.

In the world practice, the existing approaches to the assessment of high-tech exports can be divided into three groups depending on the degree of their application (Reinert, 1999; Chaudhuri, Chakraborty, 2010; Ketels, 2015):

– sectoral (by economic activity type);

– product-based (by end product and its knowledge-intensity) with a breakdown into 9 groups;

– patent (on high-tech patents).

These approaches are used by government agencies of most countries, as well as in the analytical activities of many major organizations (OECD, World Bank, UN statistical office, Eurostat, national statistical services).

We propose the following step-by-step algorithm to achieve the aim and the tasks of the study.

1. Determination of Russia's share in global exports and imports of goods, which reveals the country's position on the world stage in comparison with foreign countries. Calculation of Russia's high-tech export volumes in comparison with foreign countries (including determination of: export volumes, billion dollars; share in world export volumes, %; share in volumes of all supplies of the country to foreign markets, %).

2. Determination of quantitative and qualitative characteristics in the development of digital technologies through the assessment of high-tech export trajectory in the constituent entities of the Russian Federation. Determination of the high-tech orientation of the RF constituent entities by assessing the high-tech export trajectory of the subjects by commodity group ("Computers

and office equipment, electrical equipment and scientific instruments"; "Electronics and telecommunications"). This makes it possible to systematize the regions (by the volume of exports by commodity group, million US dollars; by the region's share in total exports). This allows systematizing the regions (by export volume by commodity group, million US dollars; by the region's share in the total export volume, %), as well as to identify the leading regions according to the high-tech export trajectory index. The assessment of the high-tech export trajectory helps to better understand the key drivers of digital technology development.

3. Grouping the trends and challenges occurring in import substitution in digital transformation and information technology, which have an impact on the development of digital technologies.

4. Development of proposals for the formation of support measures for the import substitution strategy in the field of digital technologies, taking into account industry specifics.

Such an algorithm is justified by the use of both sectoral and product approach in the development of high technologies. This, in turn, constitutes the research significance.

Key finding of the research

Import substitution for Russia is not an absolutely new period of the country's economic development. The process began after the devaluation of 1998, when the share of Russian products in the consumer basket became higher than that of foreign products. In 1998, the amount of imported goods decreased by 20% (74 billion US dollars), and in 1999 – by another 28% (to 53 billion US dollars) (Bereznev, Kulpina, 2022; Gulin et al., 2015). However, the demand, which strongly increased in the post-crisis period, was satisfied rather quickly and without much difficulty, which was facilitated by the extensive development of idle production capacities. Thus, one of the main economic growth factors was the reduction of imports caused by devaluation. The most significant impact of import substitution as a factor of economic growth was on manufacturing production in 1999–2000. Some economists note that GDP growth and increase in industrial production in 1999 were 25% due to import substitution (Glaziev, 2022; Gulin et al., 2015).

According to the 2021 results, the Russian Federation ranked 13th (8th in 2012) among the world exporters of goods and 22nd (17th in 2012) in the world ranking of importers of goods. The share of the Russian Federation in 2021 in world exports amounted to 1.9%, in imports – 1.3%. Russia is the leading exporter of raw materials, semi-finished products, as well as products of primary forms and simple products *(Tab. 1)*. It remains a "passive" exporter in the supply of engineering products, pharmaceuticals, mass market goods used for household and other purposes, special purpose products (photo and movie goods).

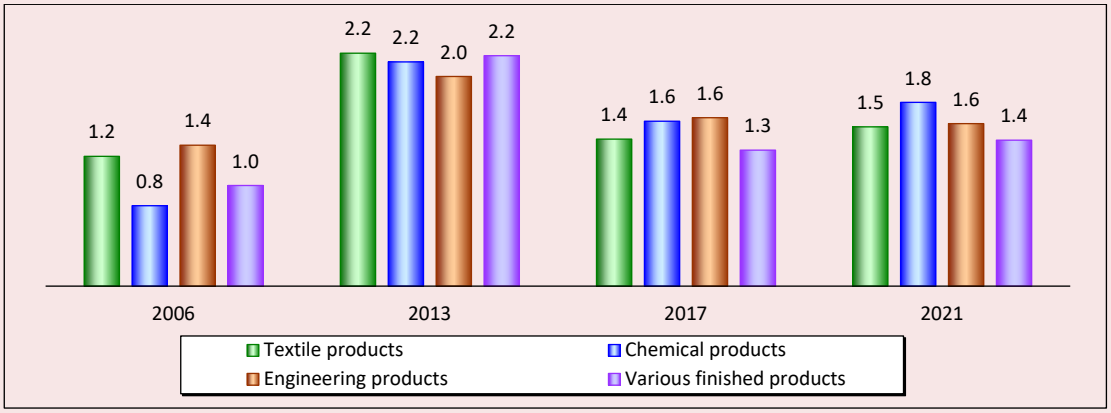
In the share of world imports, the list of the main "growing" commodity items of Russia in 2021 included textile products – 1.8%, goods of the chemical industry – 1.6%, engineering products – 1.5%, miscellaneous finished goods – 1.4% *(Fig. 1)*. The increase in the share in world imports for these commodities over the period from 2006 to 2021 ranges from 0.2 to 1%. In addition, in the same commodity groups, the value volumes show growth from 2.5 to 3.5 times for the same analyzed period.

Currently, the volume of the global market of high-tech products is estimated by the World Bank at 3 trillion US dollars (energy market – 0.7 trillion US dollars). Meanwhile, Russia's share in global high-tech exports in 2021 was 0.4%. For comparison, China – 33.5%, Germany – 7.4%, the USA – 6.0%, the Republic of Korea – 5.8%, Singapore – 5.7%, Japan – 4.1%, Malaysia – 3.9%, France – 3.5%, UK – 2.4% *(Tab. 2)*.

Table 1. Russia's share in the value of world exports of goods, %

Product item	2006	2013	2017	2021	2021 to 2006, p.p.
"Leading" exporter					
Fertilizers	14.1	13.8	14.1	14.9	0.7
Fuel and energy products	10.9	11.3	8.9	8.3	-2.6
Nickel and its products	22.5	13.9	10.5	6.7	-15.8
Wood and wood products; charcoal	6.0	5.6	5.9	6.3	0.4
Cereals	3.1	3.8	7.2	6.0	2.9
Ferrous metals	5.4	5.1	5.0	5.2	-0.3
Fish and crustaceans	0.8	2.7	2.9	4.4	3.5
Other non-precious metals, metal ceramics and products thereof	6.2	4.7	4.8	3.7	-2.5
Precious stones, precious metals and articles thereof	1.5	1.6	1.7	3.7	2.2
Aluminum and its products	5.1	4.4	3.9	3.6	-1.5
"Passive" exporter					
Nuclear reactors, boilers, equipment and mechanical devices and parts thereof	0.31	0.43	0.41	0.43	0.12
Pharmaceutical products	0.08	0.12	0.14	0.30	0.23
Furniture; bedding, mattresses, mattress bases, sofa cushions	0.28	0.21	0.21	0.28	0.01
Means of land transportation (except railway or streetcar rolling stock)	0.24	0.36	0.24	0.25	0.01
Instruments and apparatus for optical, photographic, cinematographic, measuring, controlling purposes	0.21	0.28	0.32	0.25	0.04
Tools, devices, knives, spoons and forks made of non-precious metals and parts thereof	0.21	0.28	0.32	0.25	0.04
Electrical machinery and equipment and parts thereof; sound recording and reproduction equipment	0.15	0.22	0.17	0.18	0.03
Sports equipment and its parts and accessories	0.08	0.12	0.12	0.16	0.08
Clothing and textile products	0.01	0.05	0.07	0.12	0.10
Photo and movie products	0.04	0.04	0.06	0.10	0.06
Based on the data from the International Trade Center digital platform. Available at: https://www.trademap.org/					

Figure 1. Russia's share in the value of world imports of goods, %



Source: based on the data from the International Trade Center's digital platform. Available at: https://www.trademap.org/ (accessed: May 30, 2024).

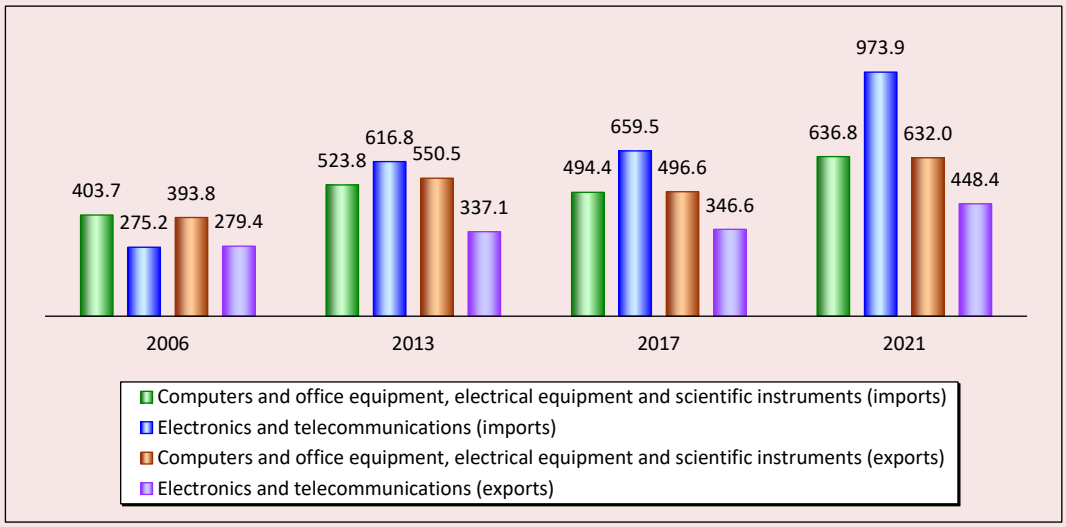
Table 2. Volumes of Russia's high-tech exports in comparison with foreign countries

Country	2006			2013			2017			2021			Dynamics, %		
	V	S (W)	S (C)	V	S (W)	S (C)	V	S (W)	S (C)	V	S (W)	S (C)	2021 to 2006	2021 to 2013	2021 to 2017
China	273.1	14.9	28.2	655.9	28.3	28.0	654.2	24.5	29.2	942.3	33.5	29.7	345.0	143.7	144.1
Germany	163.2	8.9	14.7	209.3	9.0	12.9	195.2	7.3	13.2	209.7	7.4	14.5	128.5	100.2	107.4
USA	219.0	12.0	21.3	169.2	7.3	9.6	154.5	5.8	9.9	169.2	6.0	10.7	77.3	100.0	109.5
South Korea	93.4	5.1	28.7	143.5	6.2	25.4	166.7	6.3	32.0	164.0	5.8	25.6	175.6	114.3	98.4
Singapore	124.7	6.8	45.9	143.3	6.2	35.0	146.8	5.5	44.1	159.9	5.7	34.9	128.3	111.6	109.0
Japan	129.2	7.1	20.0	111.1	4.8	15.4	106.2	4.0	16.0	116.5	4.1	15.5	90.2	104.9	109.7
Malaysia	63.5	3.5	39.5	67.1	2.9	36.3	74.1	2.8	39.3	108.7	3.9	29.4	171.2	162.0	146.6
France	81.5	4.5	16.4	118.7	5.1	16.7	108.8	4.1	17.8	97.5	3.5	20.4	119.7	82.2	89.7
UK	119.4	6.5	26.5	74.7	3.2	14.3	73.7	2.8	14.6	66.7	2.4	13.7	55.9	89.3	90.5
Switzerland	31.1	1.7	21	54.3	2.3	10.1	29.8	1.1	9.2	38.2	1.4	15.2	122.8	70.3	128.0
Canada	26.7	1.5	6.9	32.2	1.4	5.8	26.94	1.0	6.5	29.09	1.0	7.0	108.9	90.4	108.0
Russia	3.9	0.2	1.3	9.2	0.4	2.1	10.4	0.4	2.0	10.6	0.4	1.8	270.6	114.7	101.9

Note: V – export volumes, billion US dollars; S (W) – share in world export volumes, %; S (C) – share in volume of all supplies of the country to foreign markets, %.
Source: based on The World Bank Group data. Available at: https://data.worldbank.org/topic/private-sector?view=chart

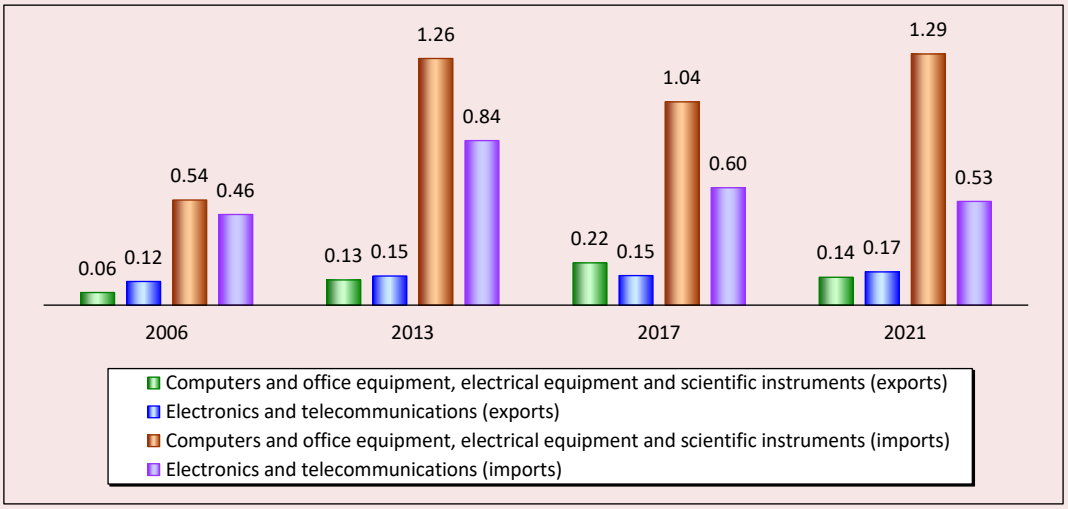
The world high-tech product market is analyzed from the perspective of segment groups that are associated with the development of digital technologies *(Fig. 2)*. The value of the world import market for the fifteen-year period for the two product items included in the high-tech segment increased by 157.7% and 3.4 times, respectively, and their share in 2021 amounted to 2.8 and 4.3%. For these commodity groups, the world export market value increased by 160.4% and 3 times, and the share of these goods in exports in 2021 amounted to 2.9 and 3.6%.

Figure 2. Value of high-tech goods in world trade, billion US dollars



Source: based on the International Trade Center's digital platform data. Available at: https://www.trademap.org/ (accessed: May 30, 2024).

Figure 3. Russia's share in global trade in high-tech goods, %



Source: based on the International Trade Center's digital platform data. Available at: https://www.trademap.org/ (accessed: May 30, 2024).

The development of digital technologies is directly related to the global high-tech product market. Russia's position in the global trade in "high-tech" products reflects the mirror opposite of exports and imports *(Fig. 3)*. The share of Russian supplies in world exports for the two main product items of the high-tech sector for the period from 2006 to 2021 did not reach even 0.3%. However, the share of Russian participation in global imports of high-tech products over the same period varied in the range from 0.5 to 1.3%, which is almost ten times higher than exports in some years. This is undoubtedly due to the long elaboration in the state economic policy of the directions of development in the sphere of non-resource sector. In fact, tactical guidelines in the sphere of non-resource exports began to be formed with the adoption of the national project "International Cooperation and Export" in December 2018[7]. At the same time, the development of the high-tech sector as a necessary strategic benchmark in the economy and a factor ensuring technological sovereignty started only in 2022.

We analyzed the need for digital technologies in the Russian Federation. According to the ANO "Digital Economy", the potential of the market for digital solutions for smart cities and regions at the end of 2023 could amount to 840 billion rubles. Most of the demand for digital technologies was met by imports. However, due to the introduction of a large number of restrictive sanctions on the import of digital technologies to Russia by the USA, the UK, South Korea, Japan and other countries since February 2022, the problem of finding new sources to meet the demand for digital technologies has arisen.

[7] Passport of the national project "International Cooperation and Export". Available at: http://government.ru/info/35564/

A joint study by the HSE University and the Russian Union of Industrialists and Entrepreneurs shows that the share of information and communication technologies is less than 1% of Russia's GDP. For comparison, this indicator reaches 3% and more in Western European countries. It follows that Russia has significant growth potential in such segments of the IT market as IT services, software and cloud services[8].

Nevertheless, there are mixed estimates regarding this potential. According to an International Data Corporation study[9], a leading international IT research organization, the IT market in Russia will reach 31.2 billion US dollars in 2021. The growth rate reached 1.3%. However, according to the estimates of international research agencies[10], the Russian IT market volume decreased by 39% in 2022 (12.1 US billion dollars) and reached only 19.1 billion US dollars.

According to the Union of Innovation and Technology Centers of Russia, purchases of domestic laptops and software by state companies from 2021 to 2023 should be a share of 50% and above: in 2021, it was 50%, 2022 – 60%, 2023 – 70%[11]. However, the attitude to the presented data may differ because in the materials of the open analytics of Delovoy Profil Group it is stated that government customers were able to make purchases under the guise of domestic products of non-Russian equipment at the expense of the existing privilege, which also contributed to the expansion of the register of IT-companies[12].

The first important step in the process of developing the sphere of digital technologies should be the assessment of the high-tech orientation of the RF subjects, analysis of specialization, identification of opportunities for diversification of the economy under the influence of external environment risks.

Let us consider the trajectory in the sphere of high technologies in the international market of the constituent entities of the Russian Federation in the commodity group "Computers and office equipment, electrical equipment and scientific instruments" *(Tab. 3)*.

The highest value of the high-tech export trajectory coefficient for the commodity group "Computers and office equipment, electrical equipment and scientific instruments" is characterized by such regions as the Tomsk Region (specialization index was 28), Moscow (26.3), the Arkhangelsk Region (16.7), the Irkutsk Region (15.5), the Altai Territory (8.7). Saint Petersburg (9.8), the Novgorod Region (7.8), and the Novosibirsk Region (7.5) have high export trajectory coefficients for this commodity group, but their contribution to the total volume of high-tech exports is 0.02, 0.1, and 0.9%, respectively. A small share in the total volume of exports (5.3%) with a high export trajectory coefficient (26.3) is once again demonstrated by Moscow, which cannot be considered export-oriented in this commodity group either.

[8] How import substitution in IT is progressing. Available at: https://www.vedomosti.ru/partner/articles/2023/06/27/982631-kak-prodvigaetsya-importozameschenie-v-it

[9] IDC research. Available at: https://www.idc.com/cis/research

[10] Ministry of Digital Development, Communications and Mass Media of the Russian Federation. Industry statistics. Available at: https://digital.gov.ru/ru/activity/statistic/?utm_referrer=https%3a%2f%2fyandex.ru%2f

[11] Analysis of problematic sectors of the Russian economy + measures. Available at: https://ruitc.ru/news/analiz-problemnykh-sektorov-ekonomiki-rossii-meropriyatiya/

[12] Changing structure of the IT market by the end of 2022: Benefits, development, import substitution, market for IT specialists. Available at: https://delprof.ru/press-center/open-analytics/izmenenie-struktury-it-rynka-po-itogam-2022-goda-lgoty-razvitie-importozameshchenie-rynok-it-spetsia/; Digital Public Administration. Available at: https://digital.gov.ru/ru/activity/directions/882/

Table 3. High-tech export trajectory of Russian regions in the commodity group "Computers and office equipment, electrical equipment and scientific instruments" in 2021

No.	Leading regions by trajectory indicator*	Region's share in total exports, %	High-tech export trajectory index	Export volume by commodity group, million US dollars
1.	Tomsk Region	1.8	28	76.5
2.	Moscow	5.3	26.3	150.9
3.	Khabarovsk Territory	4.9	17.2	51.9
4.	Arkhangelsk Region	7.2	16.7	75.1
5.	Irkutsk Region	24.1	15.5	251.2
6.	Saint Petersburg	10.5	9.8	114.4
7.	Altai Territory	1.4	8.7	14.4
8.	Novgorod Region	1.8	7.8	19.7
9.	Novosibirsk Region	5.0	7.5	109.3
10.	Krasnoyarsk Territory	5.8	3.9	602.3
11.	Perm Territory	4.5	3.2	46.5
12.	Leningrad Region	5.3	2.1	55.2
13.	Sverdlovsk Region	4.7	1.1	58.7

* Regions ranked by high-tech export trajectory index.
According to: database of the Federal Customs Service of the Russian Federation. Available at: https://fedstat.ru/indicator/54389

Table 4. High-tech export trajectory of the constituent entities of the Russian Federation for the commodity group "Electronics and Telecommunications" in 2021

No.	Leading regions by trajectory indicator*	Region's share in total exports, %	High-tech export trajectory index	Export volume by commodity group, million US dollars
1.	Novosibirsk Region	10.1	11.9	42.9
2.	Chelyabinsk Region	10.5	10.3	40.0
3.	Krasnoyarsk Territory	14.2	9.5	55.2
4.	Belgorod Region	4.9	7.6	19.1
5.	Sverdlovsk Region	4.3	6.8	44.2
6.	Irkutsk Region	5.9	3.8	23.5
7.	Kemerovo Region	5.7	2.4	22.1

* Regions ranked by high-tech export trajectory index.
According to: database of the Federal Customs Service of the Russian Federation. Available at: https://fedstat.ru/indicator/54389

Let us analyze the trajectory of the RF constituent entities in the sphere of high technologies in the international market in the commodity group "Electronics and telecommunications" in 2021 *(Tab. 4)*.

Having calculated the export specialization coefficient for the "Electronics and Telecommunications" commodity group, we can draw the following conclusion. The seven RF constituent entities considered above (Novosibirsk Region, Chelyabinsk Region, Krasnoyarsk Territory, etc.) provide 68% of all electronics and telecommunications exports. Such regions as the Novosibirsk Region (the trajectory index amounted to 11.9), the Chelyabinsk Region (10.3), the Krasnoyarsk Territory (9.5), and the Belgorod Region (7.6) have high trajectory coefficients.

In this regard, support for scientific, technical and innovation activities in the implementation of industrial policy in Russia can be carried out by public authorities by:

– placement of assignments for research, development, experimental design and technological work under the state defense order;

– granting subsidies to subjects of activity in the sphere of industry to finance research, development and technological works carried out in the course of implementation of investment projects in the branches of industry not related to ensuring national defense and state security;

– stimulating innovation activity in business companies with state participation or in non-profit organizations created by the Russian Federation or a constituent entity of the Russian Federation by exercising the rights of the Russian Federation or a constituent entity of the Russian Federation as a participant (shareholder) of the respective business company or a founder of a non-profit organization;

– stimulating demand for innovative products, including through rationing in the sphere of procurement of goods, works and services for state and municipal needs;

– providing financial support to organizations engaged in innovative activities in the provision of engineering services, in the implementation of projects to improve the level of environmental safety of industrial production, including through the use of the best available technologies;

– creation of conditions for coordination of activity of subjects in the sphere of industry in realization of scientific, scientific-technical and innovative activity and for cooperation between subjects of the specified types of activity;

– stimulating activities to create or master the production of industrial products by introducing into production the results of intellectual activity related to priority areas of development of science, engineering and technology or critical technologies;

– stimulating activities on the use of the best available technologies in industrial production.

As we have already noted, Russia is the "leading" exporter in commodities, including supplies of mineral products. The world experience distinguishes two groups among the countries-exporters of fuel and energy complex commodities (Nakhli et al., 2021). The first group includes countries with an insufficient domestic market (due to low production volumes), and the second group includes countries that follow their own path in the industrialization strategy with a focus on import substitution. Russia is one of the representatives of the second group of countries. Iran belongs to the same group. Both states have similar underlying assets in the economy related to comparative advantage in international trade as well as in fighting the restrictive policies of the West. Many studies have examined the various effects of sanctions on Iran's economy (Ebrahimi, 2017; Nakhli, 2021; Kandil, Mirzaie, 2021). Import substitution was believed to be one of the ways to overcome the negative effects. We should say that about 82% of imports in Iran are used in various manufacturing sectors (Lotfalipour et al., 2021). Another important feature of Iranian industrialization was the lack of internal interconnections in the industrial sector and its heavy dependence on imported components (Kandil, Mirzaie, 2021). With the intensification of economic sanctions in Iran, importing intermediate and capital goods has become more difficult, and technology transfer issues have made it problematic for most industries to continue operating (Nejati, Bahmani, 2020; Kandil, Mirzaie, 2021). Faced with payment deficits and difficulties in expanding industrial exports, resource-rich Iran began limiting its own imports and hence encourage import substitution (Ebrahimi, 2017; Kandil, Mirzaie, 2021). The main goals for Iran were to increase income and diversify productive activities and reduce

dependence on natural resource extraction as the main source of income (Nakhli, 2021; Kandil, Mirzaie, 2021). Taking into account Iran's experience, the import substitution strategy in Russia should be used for both long-term and short-term goals, overcoming crisis situations, as well as strengthening potential non-resource and high-tech sectors of the economy closely linked to the development of digitalization.

In Russia, the task of implementing the digital transition based on Russian developments is enshrined in the text of the national project "Digital Economy"[13]. The targets specified in the project passport indicate the need to achieve an annual increase in the share of Russian software purchased or leased by the authorities by at least 5%. Thus, this indicator should increase from 70% in 2020 to 90% in 2024. For state corporations and companies with state participation, the share of Russian software should increase from 50% in 2020 to 70% in 2024[14].

According to the Presidential Decree on measures to support the IT industry, Russian IT companies are exempted from paying profit tax and from any inspections for three years[15]. They also have access to preferential loans of up to 3% per annum "for the continuation of work" and the realization of new projects. In addition, employees of Russian IT-companies have access to mortgages on favorable terms and deferment from service in the Russian army until the age of 27. This decision contributes to the reduction of staff outflow.

In addition, it is planned to increase the number of existing grants aimed at supporting the development of domestic solutions. The listed items (reduction of tax burden, grants for IT research, state support) constitute the first package of measures to accelerate the development of the Russian IT sector.

Active government support of IT development companies[16] in the following areas contributes to solving many of the problems identified in the field of import substitution:

1. *State regulatory measures:*

– legalization of parallel imports (to eliminate problems related to the shortage of hardware solutions);

– use of exclusively domestic software in government agencies and companies.

2. *Financial support for import substitution:*

– grant payments;

– implementation of development co-financing programs;

– preferential lending to businesses;

– ensuring the use of Russian software on favorable terms (discounted) –which can be used by small and medium-sized companies.

3. *Social and legal support for IT developers:*

– preferential mortgage programs;

– simplification of obtaining residence permits for foreign IT specialists;

– grants for implementing educational programs to train developers.

Two roadmaps were launched in the field of development of domestic information technologies and software at the end of 2022: the first one is "New Industrial Software", includes support measures for developers of design systems, application software (Product Lifecycle Management), BIM (specific technologies for the construction industry), etc.; and the second – "New System-wide Software" focuses on supporting developers of office applications and packages, and systems related to database management, etc.

[13] Digital economy of the Russian Federation. Available at: https://digital.gov.ru/ru/activity/directions/858/?utm_referrer=https%3a%2f%2fyandex.ru%2f

[14] Import substitution in IT industry. Available at: https://www.garant.ru/article/1542142/

[15] On measures to ensure accelerated development of the information technology industry in the Russian Federation: Presidential Decree 83, dated March 2, 2022. Available at: http://publication.pravo.gov.ru/Document/View/0001202203020001

[16] Import substitution as a driver of digital transformation. Available at: https://blogs.forbes.ru/2022/12/29/importozameshhenie-kak-drajver-cifrovoj-transformacii/

These roadmaps have been approved by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation. The roadmaps include more than three hundred projects related to import substitution of foreign software. At the same time, a significant share of the projects is implemented by the company's own resources. In general, the total amount of these projects is more than 200 billion rubles. For most of these projects, agreements are to be concluded with the Russian Government in the future in terms of creating conditions to ensure guaranteed demand for the products. The following financial resources are expected to be attracted for other projects:

– loan funds (approximately 20 billion rubles);
– grant funds (over 23 billion rubles).

We should note that already in December 2022 (data from the website of the Government of the Russian Federation) there was information that the companies have reached the last stage of concluding a grant agreement with the Skolkovo Foundation and the Russian Foundation for the Development of Information Technologies[17]. It is also worth emphasizing that since 2015 the Unified Register of Russian Programs for Computing Machines and Databases has been operating in Russia[18].

In addition, the Ministry of Industry and Trade of the Russian Federation has established a unified register of Russian radioelectronic products and a unified register of telecommunications equipment of Russian origin, which relate to information and communication technologies and software products.

The development of Russian IT companies is facilitated by a number of measures implemented under the state program "Digital Economy". There are benefits for businesses (except for sole proprietorships) and for employees of companies. At the same time, there are some conditions required to receive the benefits[19]:

– share of revenue should be 70% of all revenues (including revenues from the development and sale of proprietary software or electronics);

– a company should have state accreditation with the Russian Ministry of Finance; it is worth emphasizing that this agency supervises two registers: accredited IT companies and the register of domestic software developers; at the same time, companies that plan to receive existing benefits for their business should take into account that the state accreditation of the Ministry of Finance is a prerequisite; in general, state accreditation is issued indefinitely, but the Ministry of Finance has the right to cancel it[20].

The following benefits are available to digital technology organizations through the end of December 2024[21]:

– zero income tax rate;
– VAT rate for software developers – 0%;
– tariff of insurance premiums with a reduced rate, which is 7.6%;
– inspections by state authorities have been canceled (including currency and tax inspections);
– providing loans with a reduced rate (3% maximum) until 2025;
– other benefits in the form of grants, as well as simplified recruitment of employees from abroad and simplified public procurement.

[17] Regulatory framework for the digital environment. Available at: https://digital.gov.ru/ru/activity/directions/862/; Digital technologies. Available at: https://digital.gov.ru/ru/activity/directions/878/

[18] Information infrastructure. Available at: https://digital.gov.ru/ru/activity/directions/870/

[19] Digital economy of the Russian Federation. Available at: https://digital.gov.ru/ru/activity/directions/858/?utm_referrer=https%3a%2f%2fyandex.ru%2f

[20] Information security. Available at: https://digital.gov.ru/ru/activity/directions/874/

[21] Benefits for IT companies and IT workers that apply in 2023. Available at: https://secrets.tinkoff.ru/bezopasnost-biznesa/lgoty-it/

Russia is implementing a project called Digital Professions[22] to develop the human resources component of the digital economy. It includes a variety of additional education programs for different audiences in terms of IT knowledge. This project operates within the framework of the federal project "Personnel for the Digital Economy". We should also emphasize that the Digital Professions project provides benefits for different categories. To make the project more informative, the website "цифровыепрофессии.рф" has been created. For 2022, training for more than 50 thousand people with a 100% discount has been planned. In addition, people with disabilities and unemployed citizens who are registered with the employment service have the right to be trained free of charge.

The import substitution support measures under consideration can be supplemented by initiatives of private companies, regional and municipal authorities, investors interested in investing in IT developments as an actively developing sector of the Russian economy.

Trends, problems in import substitution of domestic digital technologies and development proposals

The main trends of import substitution in Russia in the field of digital technologies include the following:

– domestic development has an opportunity for qualitative development;

– products developed by industry leaders can compete with foreign companies;

– acceleration of implementation projects (time costs – 2–4 months);

– freezing of implementation projects involving foreign vendors;

– appearance of new software classes in the Russian software classifier;

– a section of industry-specific application software will appear in the Russian classifier to solve industry-specific tasks.

The list of the main problems of Russian import substitution in the sphere of information technologies includes the following:

– the need for personnel for the digital economy, namely developers, analysts, and methodologists;

– the scarcity or even complete absence of integrated data networks;

– deficit of developments in the field of security (especially clearly in the direction of secure solutions);

– speed of replacing foreign solutions with domestic developments;

– there are no industry standards in terms of development.

According to expert estimates, import substitution in most areas in the field of digital solutions will be quite successful in the perspective of 4–5 years[23]. In addition, there are more than 16 thousand different solutions in the register of domestic software, and their number is increasing. Given such dynamics, there is every chance that in the coming years, basic business processes at enterprises in Russia will be reproduced through the use of domestic software products and technologies.

The analysis has shown that the priority of economic policy at the moment is to stimulate import substitution processes in the field of digital technologies, with the ultimate goal being the economic development of Russian territories. For this purpose, it is reasonable and necessary to work systematically to achieve an increase in the import substitution potential in the IT sphere.

[22] Ministry of Economic Development: Import substitution will be the main trend in the coming years. Available at: https://rg.ru/2022/05/31/otkryvaiutsia-vozmozhnosti.html

[23] Changing structure of the IT market by the end of 2022: Benefits, development, import substitution, market for IT specialists. Available at: https://delprof.ru/press-center/open-analytics/izmenenie-struktury-it-rynka-po-itogam-2022-goda-lgoty-razvitie-importozameshchenie-rynok-it-spetsia/

The launch and acceleration of processes aimed at import substitution in the field of digital technologies requires the implementation of comprehensive systemic steps. To successfully implement the import substitution policy at the initial stage, it is advisable to develop an Import Substitution Strategy. It should be based on the development of integration and cooperation both between companies in priority industries and with educational and research centers. The strategy goal is to create conditions for the replacement of digital technologies produced abroad with competitive domestic products that are not inferior in quality and price.

The main directions of the strategy should be the replacement of imported products and developments in the field of IT with those supplied by local companies; creation of own products and developments supplied to the domestic and foreign market.

Its implementation will lead to GDP growth by increasing the competitiveness of domestic products in the field of IT in both domestic and global markets; development, implementation, manufacture of new and unique products in the field of digital technologies by domestic manufacturers due to the application of the results of fundamental knowledge and applied work; formation of new basic sectors in the field of digitalization to solve industry problems and the emergence of promising market niches.

The formed direction of import substitution in the digital sphere will be able to attract new participants, which will affect the development of own products in the field of digital technologies, improve the quality of human resources. In addition, it will improve the efficiency of interaction between manufacturers and consumers, technical and technological equipment of import-substituting production facilities, expand the geography of sales of import-substituting products, as well as develop new and adjust existing methods and tools focused on stimulating and promoting import substitution for the development of domestic digital technologies.

Conclusion

In general, the opportunities for import substitution in the sphere of digital technologies in Russia at the current stage are quite large. The departure of many Western developers has freed up huge niches in the whole range of software solutions. These include system and application applications, cloud software, database management systems, solutions for computer-aided design, accounting and management. At the same time, the market demand for solutions for relevant purposes is high and continues to grow as the economy continues becoming more technologized and digitalized.

Thus, the key direction in the field of digital technologies in the coming years should be a gradual, systematic import substitution. It should be based on the establishment of an integral proprietary ecosystem that will promote the development, implementation and production of domestic products in the field of digital technologies. Active development in this direction will help ensure Russia's technological sovereignty, as well as become a driver for the formation of new industries, sectors and niches in the development of digital products and services. This will make it possible to produce in-demand, unique products both to replace foreign analogues and to provide specific advantages in the global market, and will increase motivation for the emergence of new domestic players in the digitalization market. All this will become the main catalyst for the activation of new types of economic activities, which will require the implementation of the solution of updated tactical tasks in the field of digital transformation.

The study presents an approach to identifying barriers and opportunities for import substitution of digital technologies in Russia, which takes into account both quantitative and qualitative characteristics to assess the high-tech sector. In

addition, a step-by-step algorithm for identifying import substitution opportunities in digital technologies has been developed, which takes into account industry specifics and proposes a conceptual framework for developing a strategic action model. Using the proposed approach, it becomes possible to present the contribution of economic actors and its specifics in the field of IT, which makes it possible to determine the prospects for further development of the region's economy and scientific and production cooperation. The research results confirm that the development of digital technologies is associated with such an import substitution policy, which will stimulate the development of existing high-tech industry segments and promote the formation of new areas focused on the production of competitive high-tech world-class goods in the country and regions.

The research contributes to the development of theoretical and methodological issues of digitalization of the economy and import substitution. Its results can be used to analyze the state policy in the field of digital technologies and in the assessment of measures to support the digital economy, as well as in the development of program-target documents in the conditions of digital economy development at the federal and regional levels.

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