RUS®SOFT

Russian Software industry

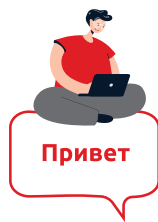19-th Annual Survey

2022

Contents

DEAR COLLEAGUES AND FRIENDS

I bring to your attention the results of the 19th study of the software development industry in Russia, which has been annually conducted by the Non-Profit Partnership of Software Developers RUSSOFT (RUSSOFT Association) since 2004.

In 2022, due to the special military operation in Ukraine, we had to divide collecting primary questionnaires into 2 stages – before and after the special military operation start. As a result, 171 questionnaires were collected from representatives of the software development industry, and this turned out to be enough to conduct a full-fledged study. In addition, various sources of information were traditionally used, expert opinions were received from the directors of software development companies.

The results of the 2022 survey confirmed our assumptions that the past 2021, despite ongoing coronavirus waves and turbulence of the global economy and geopolitics, was successful for the Russian software development industry.

In 2021, in Russia, total turnover of software industry enterprises amounted to ₽1.56 trillion, having increased by 19%. Revenues from exports and from sales in Russia (in rubles) increased equally – by about the same 19%.

If we consider growth rate of total turnover of the industry enterprises, the year of 2021 turned out for the software industry to be one of the most successful over the past decade.

The share of the US and EU markets in the total volume of software exports from Russia and software development services continued to reduce. But this happened not because of reduced sales in developed markets, but due to increased exports in emerging markets, where Russia was able to provide security and e-government solutions alternative to those of world leaders, de facto offering these countries "Digital Sovereignty".

In 2021, service companies kept their positions in the ranking of 100 leading service companies worldwide (according to IAOP), taking 6 positions in it. In the same year, Russian software manufacturers' position in the "magic quadrants of Gartner" continued to strengthen, it is especially worth noting our companies' success in the field of information security (in 2021, already 7 companies were included in the ranking of the global best software suppliers in the field of information security). Obviously, due to sanctions, Russian IT companies will not be able to keep their positions in 2022, and for some time, it will be impossible to assess domestic software companies by these ratings.

Unfortunately, we failed to make the forecast for the industry development for 2022, because of the SVO in Ukraine and the subsequent flow of anti-Russian sanctions. Due to unpredictable course of events during the military operation, we had to shrink the forecast horizon to the first half of the year. But even under these conditions, respondents expressed restrained optimism about succession of events in the software and its development service market in Russia, which is associated with expected acceleration of works in the field of IT import substitution.

And as usual, I express my sincere words of gratitude to our chief analyst Dmitry Zhelvitsky and administrative director Elena Lagunova for their great work on collecting information, preparing the report, and ranking top companies in the industry and leading universities training new and new generations of software developers.

We are very grateful to the Association of Computer and Information Technology Enterprises (AP KIT) and our sponsors for their multiyear support in conducting the study.

And many thanks to all those who participated in the survey, providing information about their companies.

Sincerely,

President of RUSSOFT
Valentin Makarov

POSITIONS OF RUSSIAN SOFTWARE COMPANIES IN THE GLOBAL IT MARKET

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POSITIONS OF RUSSIAN SOFTWARE COMPANIES IN THE GLOBAL IT MARKET

Dmitry Peterson
Chief Operating Officer,
SimbirSoft

A year ago, we faced a significant increase in demand for IT services, primarily from customers from industry, fintech, retail and other fields. It resulted in revenue growth of almost 40%. The IT market has grown by 20% according to TAdviser.

However, in 2022 the needs of the market have changed. As many foreign software and hardware vendors have curtailed operations in Russia, businesses face the need to adapt quickly, and replace familiar products and services with alternative solutions. Now the domestic IT market is undergoing a transformation; new interaction chains and ways of working are being built. In current circumstances, the value of IT companies with vast expertise, practical experience and the ability to help clients develop import-substituting technologies is increasing. The current realities require flexibility and high speed of implementation of products and solutions.

Local companies have already experienced situations of rapid change. Thus, the global crisis of 2008 similarly slowed down the development of the IT industry. But, having survived it, businesses have become more

responsible in developing IT systems in order to increase the productivity of processes and reduce possible risks. For several years, Russian companies have been systematically moving its processes beyond the limits of vendor automation systems and developing its own IT solutions. Many years of practice have taught businesses to act strategically, calculate risks in advance, localize services and systems within a company, on their own servers, in order to be able to manage processes and not to depend on external solutions.

The pandemic has shown that companies with high levels of digital maturity are more resilient in a changing environment and capable of rapid restructuring. In 2022, the trend towards conscious transformation and IT strategy planning continues. Attempts to increase profit margins by automating and robotizing business processes have given a new surge of interest in artificial intelligence technologies, including machine learning and big data analysis. Such solutions are in demand in almost all industries, and their popularity will increase in future.

Work on global markets also runs its course, since new unique software is

always in demand regardless of location. We continue to cooperate with partners in the USA, the UK, Germany, Belgium, Cyprus and other countries. Like other companies, we open branch offices abroad, including the CIS countries. We are also actively building connections with partners in the Middle East and Latin America. We work with different clients from various industries and countries, and we are sure that now we need to expand our horizons in order to diversify our business.

1.1. Russian ICT market

RUSSOFT does not conduct its own research on the Russian IT market. Analysts of the Association conclusions about the condition of this market only based on the analysis of data obtained from numerous open sources (reports of research companies, published ratings, official data of indicators of the largest Russian IT companies).

Based on its own research, RUSSOFT can only assess the correctness of the measurement of the software segment of the IT market, since it has information on the sales of Russian software developers on the domestic market.

According to IDC the Russian IT market has reached USD 25 bln in 2019 (1.609 tln, which is 7 % more than in 2018). Most segments have grown by more than 10 %.

The performance of sales of IT equipment ("hardware") has appeared to be worse.

At one of the presentations of data made in 2022 IDC managers reported that they have faced difficulties related to obtaining full information in Russia required to correctly measure the entire IT market. RUSSOFT analysts have earlier noted a mismatch of IDC data with the data of other research companies, as well as with RUSSOFT data (sales of Russian software companies in the domestic market were much higher than the whole market size according to IDC).

For this reason, starting with the summary of 2019, a general idea of the whole market and its largest segments (first and foremost, of the "Software Market") was perceived by RUSSOFT

based on the analysis of data obtained from various sources of information. In addition to partially disclosed IDC data, the results of studies of individual segments performed by other research companies, official Russian statistics, the reports on the results of the year of the largest companies (turnover data of distributors and system integrators are of principal interest) are also available. In addition, RUSSOFT has its own data on the sales of Russian software companies in the domestic market.

Comparison of the data of analysts, large distributors and the largest companies with own RUSSOFT sales estimates of domestic companies allows to suggest that the entire IT market in Russia has increased in 2019 not by 3.9 %, but by 7–8 %, and its volume is at least USD 29 bln.

Russian IT market in 2013–2020 according to IDC

		2013	2014	2015	2016	2017	2018	2019	2020	2021
Viewpoint of foreign companies	in USD (growth/ reduction over a year)	33 bln (-1 %)	28 bln (-16 %)	17.8 bln (-39 %)	≈17 bln (-3-4 %)	21.8 bln (+17 %)	≈24 bln (+9.5 %)	24.86 bln (+3.9 %)	25.35 bln (+2.0 %)	32.6 bln (+21 %*)
Viewpoint of Russian companies	in RUB (growth/ reduction over a year)	1.05 tln (+3.9 %)	1.063 tln (+1.2 %)	1.08 tln (+1.6 %)	1.137 tln (+5.3 %)	1.27 tln (+2 %)	1.51 tln (+18.7 %)	1.61 tln (+7 %)	1.83 tln (+14.0 %)	2.40 tln (+23.5 %)
	Variance in RUB adjusted for inflation	-2.4 %	-9.1 %	-9 %	≈0 %	≈0 %	+13.8 %	+4 %	+8.7 %	+13.9 %

* — the growth indicator does not correspond to the data of the previous year, as IDC has probably recalculated the results of 2020.

The question of what is the state of the Russian IT market in 2020 is even more complicated. It is only safe to say that in RUB terms this market has increased by at least 14 %, and in USD terms — by at least 2 %. However, there

are grounds to believe that the increase was a few more percentage points higher.

The growth of 14 % in RUB and 2 % in USD in April 2021 was reported by IDC

when summing up the preliminary results of the year. With such an increase the Russian IT market has reached RUB 1.83 tln in 2020 (IDC has for the first time presented this indicator in RUB terms) or USD 25.35 bln.

The analysis of the information obtained from different sources allowed to designate a certain range of the size of the Russian IT market, as well as its growth (with the same segmentation that IDC has made in the previous years).

If we focus on the minimum indicators, the market volume based on the results of 2020 was USD 25.66 bln and showed an increase of 3 % (15 % in RUB). These results are somehow very close to the preliminary results presented by IDC.

If we focus on the maximum indicators, we get the size of the IT market of USD 34.1 bln showing an increase of 7.9 % over the year (RUB 2.46 tln with an increase of 20.6 %).

RUSSOFT estimation of the size of the Russian IT market and of its individual segments based on the results of 2020

USD 3.43 bln (+3.8 %)

USD 25.66 bln (+3 %)

USD 6.23 bln (+3.8 %)

USD 16 bln (+2.5 %)

min

USD 6 bln (+3.8 %)

USD 34.1 bln (+7.9 %)

USD 9.2 bln (+3.8 %)

USD 18.9 bln (+11.5 %)

max

■ IT equipment
■ IT services
■ SW
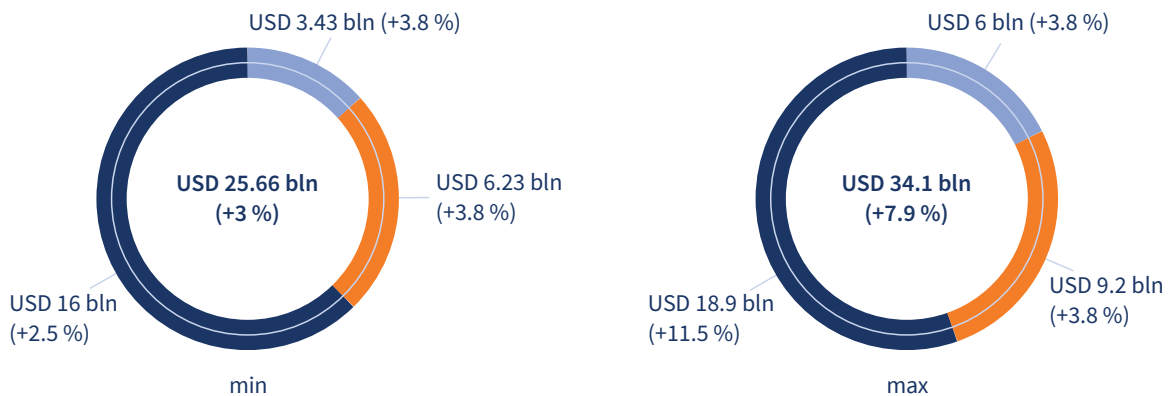
Source: Calculated based on IDC, ITResearch, RUSSOFT, "M.Video-Eldorado", MTS data

There is reason to believe that the minimum indicators reflect the existing underestimation both in absolute values and in terms of growth, while the maximum market size with the corresponding growth is quite consistent with the real state of affairs. This conclusion is based on some important indicators that highly characterize the situation in the Russian IT market.

In particular, the total revenue of the 100 largest Russian IT companies listed in the CNews rating forms such an indicator. It exceeded RUB 2 tln (almost USD 28 bln),

showing an increase of 28.6 % over the year (15.1 % growth in USD).

The version on the market volume underestimation is also confirmed by the data on the expenditures of organizations associated with information technologies indicated in the Rosstat directory "Russia in Figures 2021": by the end of 2019 such expenditures exceeded RUB 1.6 tln (USD 25 bln). Most likely, the expenditures of only large and medium-sized enterprises, which are obligated to report to the statistical department are reflected in the directory. These RUB 1.6 tln most certainly do not include the costs of

purchases of computers, smartphones, printers and software made by private individuals. With account for the growth in 2020 and for the costs of small businesses and households, the total IT-related expenditures in Russia may well be at least USD 34 bln.

Underestimation of the Russian software market by IDC is especially clearly visible. According to IDC calculations, the volume of this market has amounted to approximately USD 3.5 bln, while according to RUSSOFT sales of software products of Russian software companies has exceeded USD 4 bln and imports,

according to the Central Bank of the Russian Federation, have amounted to USD 4.5 bln.

However, IDC figures cannot be considered incorrect. We can talk about various approaches and methods.

The growth indicators of the Russian IT market based on the results of 2021, presented by IDC, look quite realistic. For these reasons absolute values are easier to count, regardless of which version is considered.

According to IDC, the volume of the entire IT market reached USD 32.6 bln showing an increase of 21 % (in RUB this increase was 23.5 % to RUB 2.40 tln). Thus, the market volume has recovered to the level of 2013. With no account for mobile phones and equipment of telecom operators the size of the IT market is USD 21.7 bln with an increase of 16 %.

According to RUSSOFT, the market volume has reached USD 41.3 bln (RUB 3.04 tln), and its growth continued through the past decade with a slight delay in 2015. IDC data show no doubt about the growth of the market, since the available information confirms the increase by approximately 20 % in 2021.

According to Rosstat data Russian organizations have spent RUB 3.72 tln (USD 50.5 bln) in 2021 on the introduction and use of digital technologies, which is 26 % more than in 2020. About 70 % of this amount are accounted for imports of goods and services (in 2019 — 64 %, in 2020 — 67 %). The amount of these costs shall not consist with the size of the IT market according to IDC, since different techniques are used. However, the growth of these two indicators shall not differ much (in fact, it does not differ). The same applies to the total amount of revenues of companies listed in the Tadviser rating of the 100 largest

IT companies in Russia in 2021, which amount has increased by 18 %. According to Tadviser, the entire IT market has grown by 20 % to USD 30.1 bln (RUB 2.22 tln).

Dual Currency Index of RUSSOFT

IDC and other foreign analytic companies tend to measure the Russian market in US dollars, although the national currency in Russia is rubles. The use of both US dollars and rubles can be quite justified. Much depends on which market segments are studied and which tasks are set during the study. If we focus on the interests of foreign corporations, which measure their income in US dollars or euros, then the use of the American or European currency will naturally be justified. The US dollar, as the world's reserve currency, has an advantage over the euro.

If we focus on Russian developers and IT consumers, then the importance of taking measurements in rubles is increasing.

In order not to get confused with various growth indicators (in US dollars and in rubles), RUSSOFT proposes to focus on its own dual-currency index. It involves measuring the sales of the solutions produced in Russia in rubles, and measuring the volume of imports of software, electronic devices and IT systems in dollars (with account for their share in the total volume of the Russian IT market).

According to the dual-currency index, the Russian market has grown by 5 % in 2019. At the same time, the calculations are based only on IDC data, which RUSSOFT considers rather underestimated. If we focus on the dual-currency index, it turns out that a slowdown in growth has occurred in 2019, since in 2018 this index has corresponded to an increase

of 10 %, and in 2017 — by 9 %. However, with account for the fact that, according to RUSSOFT estimates, the growth indicators of IT services and software markets should be higher than that specified by IDC, it can be argued that all the last three years the development of the IT market has been the same. The growth rate was quite decent, but also not very high.

At the end of 2020, the dual-currency index amounted to 1.134, which corresponds to an increase of 13.4 %. The growth of this indicator resulted in a high demand for the computer equipment, which arose largely due to the pandemic and the associated transition to remote operation, training, trade and entertainment.

Since in 2021 the ruble exchange rate against the US dollar almost did not change, the dual-currency index differs slightly from the indicator of the IT market growth. It amounted to 1.208 (corresponding to an increase of 20.8 %).

Obviously, this index will not be easy to calculate by the end of 2022, since, most likely, not only the average annual dollar exchange rate will change significantly, but also the structure of the IT market will become different. It is possible that there will be not enough data available to accurately determine both the size of the market and its structure.

1.1.1. Structure of the Russian IT market

The Russian IT market was considered immature due to the too high share of equipment sold in this market. In part, if the specified maturity criterion is applied, this market still remains immature. However, after many years of slow growth in the share of IT services and software, in 2014–2015 there was a sharp jump in the sales of IT services — their share increased from 20 % to 25 %. In 2016, the share of services almost did not change, and by the end of 2017 it increased by one percentage point — to 26 %. This change in 2014–2015 was primarily caused by a significant increase in the cost of imported equipment (as a result of the devaluation of the ruble due to the crisis in Ukraine) with a very small number of Russian analogues, which led

to a decrease in the sales of equipment. However, in 2017, the ruble devaluation factor could no longer contribute to the increase of the share of IT services, since significant strengthening of the ruble has happened that year.

In 2018, IDC has indicated a significant increase in sales of IT equipment in Russia (by 15 % in US dollar terms), but sales of IT services and software have not changed much. Consequently, there was some retreat and a return to the former structure existing before 2014, although the share of IT services (24 %) still remained higher than it was in 2014 (20 %). In 2019, the market structure did not change significantly, but the share of IT services and software has increased slightly.

At the end of 2020, RUSSOFT has conducted its own assessment of the Russian IT market, according to which the share of IT services and software turned out to be higher than those estimated based on IDC calculations. At the same time, according to RUSSOFT the share of IT equipment has increased slightly over the year, while according to IDC calculations this share, perhaps, has even decreased slightly. This is due to the fact that according to preliminary data presented in April 2021, the growth of the software market was slightly larger than the growth of the entire IT market, while the growth of the IT services market (there are final results for it) remained at about the same level.

Structure of the Russian IT market in 2019

	share (a year earlier)	change (absolute value)
IT equipment	62.6 % (63 %)	+3 %
IT services	24.1 % (24 %)	+5.5 %
SW	13.3 % (13 %)	+6 %
Total:	100 %	+3.9 %

Source: Calculated by RUSSOFT based on IDC data

Structure of the Russian IT market in 2020

	share	change (absolute value)
IT equipment	55.4 %	+11.5 %
IT services	27.0 %	+3.8 %
SW	17.6 %	+3.8 %
Total:	100 %	+7.9 %

Source: RUSSOFT assessment

In 2021, hardware sales showed a much bigger growth in comparison to the growth of software and IT services sales. Consequently, the share of equipment in the total market has also increased. However, since 2022, the idea of the

market structure evolution has become irrelevant. Only such a structure will be correct one that will allow Russian society and the Russian economy to withstand the pressure of unprecedented sanctions.

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Structure of the Russian IT market in 2021

	share (a year earlier)	change (absolute value)
IT equipment	66.2 %	+27.9 %
IT services	21.4 %	+7.5 %
SW	12.4 %	+13 %
Total:	100 %	+21 %

Source: Calculated by RUSSOFT based on IDC data

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1.1.2. Russian Software Market

In 2020, the growth of the Russian software market, according to IDC, amounted to 16 % — from RUB 213.5 bln to RUB 247.6 bln. Conversion into dollars at the IDC rate (RUB 64.69 for 2019 and RUB 72.32 for 2020) shows an increase from USD 3.3 bln to USD 3.42 bln (by 3.8 %).

The growth indicator looks quite realistic (sales of Russian software companies in the domestic market also increased by about 16 % in ruble terms), but the absolute value seems to be underestimated. It can be assumed that the IDC method does not cover all types of software sold in Russia.

According to the methodology used by RUSSOFT, sales of Russian software companies on the domestic market traditionally turn out to be much higher than the capacity of the entire market. At the end of 2020, domestic sales of Russian software companies amounted to USD 9.5 bln, with an increase of 4.5 % (this increase in rubles was 16.5 %).

However, this figure includes revenues from the sales of custom software, which IDC classifies as IT services.

Nevertheless, sales of domestic software products within Russia amounted to approximately USD 4.5 bln with an increase of 1 %, which turns out to be the largest software market determined by IDC. This phenomenon is partly due to the fact that a double count is factored by RUSSOFT in this indicator, since when creating a solution on the platform of a certain vendor, the cost of software of this vendor is considered twice — in the revenues of the developer of the final solution and in the revenues of the platform provider. However, this double count is unlikely to exceed USD 0.5 bln (most likely much less).

Assuming that foreign software developers sell at least USD 2 bln in Russia, it turns out that the entire Russian software market in 2020 has reached USD 6 bln.

Foreign software may account for much more than USD 2 bln, because the import of computer services, according to the Central Bank of the Russian Federation, amounted to USD 4.5 bln in 2020 with an increase of 25 % compared to 2019 (with estimated USD 3.59 bln import at yearend 2019). This import also includes custom software (some foreign vendors develop custom systems based on their platforms, and some Russian companies order software development abroad), but the supplies of relevant services from foreign companies is not large-scale (these supplies are unlikely to exceed USD 1 bln).

Thus, if we summarize the sales of software products and the sales of software development services in the Russian market, by the end of 2020 these will amount to not less than USD 10.4 bln.

Such a large difference in indicators (of IDC and RUSSOFT) can be easily explained by the use of different

approaches and methods. The methods, goals and objectives of research of certain markets can vary dramatically. Indeed, there may be many options of the ways of the software market measurements. This explains the presence of serious discrepancies in the results of the studies. Shall be custom software included in the software market or not? Shall SaaS be classified as IT services or as software? Shall the revenues of software companies from the implementation and support of software be accounted for or not? Shall custom development made by a company for a specific customer on its own replicated platform be considered as a service or as a typical solution?

Shall multiple sales of a software and hardware complex developed by a software company based on its standard software be considered as the sales of hardware or the sales of software? There are many such questions. In most cases, methodological difficulties are related to the lack of understanding whether a certain segment is related to the IT services market or to the software market.

It was indicated in Rosstat "Russia in Figures 2021" directory that in 2019 the expenditures of organizations associated the purchases of software (this figure is calculated with a delay of more than a

year) amounted to RUB 488 bln (USD 7.5 bln). It is possible that the indicator is even underestimated, since it is obtained on the basis of statistics reporting. It includes custom software, but with no account for this software, the entire corporate software market shall be about RUB 260 bln (USD 4 bln). According to most conservative estimates, in 2020 this figure has exceeded RUB 290 bln (in dollars it is definitely above USD 4 bln).

Since in previous years the Russian software market was measured in US dollars, to reflect the dynamics for 2020 it is again measured in US currency, but with duplication in rubles.

Main characteristics of the Russian software market in 2015–2021

		2016	2017	2018	2019	2020	2021	Notes
Market size (change over the year)	USD	USD 2.2 bln (-4 %)	USD 3 bln (+19 % *)	USD 3.07 bln (+2.2 %)	USD 3.3 bln (+6 %)	USD 3.42 bln (+3.8 %)	USD 4.04 bln (+13 %*)	IDC version
	RUB	—	—	—	RUB 213 bln (+8.7 %)	RUB 247 bln (+16 %)	RUB 298 bln (+15.4 %)	
	USD	USD 6–7 bln (+11–12 %)	USD 7.3–8.5 bln (+20–22 %)	USD 8–9.3 bln (+10–11 %)	not less than USD 10 bln (≈ +10 %)	not less than USD 10.4 bln (+3.8 %)	USD 12.06 bln (+16 %)	RUSSOFT version (including custom software, SaaS and implementation services), USD
	RUB	—	—	—	RUB 646 bln	RUB 750 bln (+16 %)	RUB 889 bln (+18.5 %)	
Change in rubles, with the adjustment for the official inflation rate		+16–17 %	+3.5 %	+5.5 %	+7 %	+10.6 %	+9.4 %	

* — indicated IDC growth seems to have been obtained after the adjustment of the data for the previous year

According to IDC in 2021 the Russian software market has increased by 13 % in dollar terms to USD 4.04 bln and by 15.4 % in ruble terms (up to RUB 298 bln). RUSSOFT analysts do not bring these data into question. Obviously, these data

do not cover all segments of the Russian software market (in accordance with the IDC methodology).

RUSSOFT considers the software market with the inclusion of the sales

of custom development services, having fairly accurate data on the sales of Russian software companies in the domestic market. With account for the fact that sales of foreign companies have amounted to at least USD 2 bln in

2021, the total market size, according to RUSSOFT, has reached USD 12.06 bln with an increase of 16 % over the year (in rubles the increase amounted to 18.5 % to RUB 889 bln).

It is easy to make the general forecast for 2022. It is obvious that the sales of foreign companies will decrease sharply (perhaps by more than 2–3 times). At the same time, the sales of Russian companies will increase significantly (in spring 2022 a multiple increase was registered with some of them), since it shall be required to replace the solutions of the companies that have terminated their operations in Russia. In addition, the cost of some popular Russian software products has increased by 10–20 %. For this reason the growth of the Russian software market in 2022 is still likely to continue, although it is unlikely to be significant.

We can expect a particularly large increase in the office software market due to the massive replacement of solutions, primarily those of Microsoft. According to J'son & Partners Consulting, the growth

of this market in 2021 was only 9.3 % — from RUB 38.85 bln to RUB 42.5 bln. The growth is not very large, because at the end of 2021 the saturation of the market was quite high and it was assumed that its further growth will be smooth.

According to analysts at J'son & Partners Consulting, changes in state regulation and the development of market players will result in radical changes in the market structure to be introduced in the coming 3–5 years, including a sharp increase in the share of Russian office software. A smoother trend was expected earlier in the increase of the share of Russian office software (from 7 % in 2020 to 40 % in 2026) and open source software (from 15 % to 30 %), and also in the decrease of the share of foreign software (from 78 % to 30 %) and a more uniform distribution of the market between different types of players. According to the results of a study conducted after the start of a special military operation in Ukraine, on the condition that the observed trends will remain, we can expect that by the end of 2027 a large market share will be taken

by Russian office software platforms (forecast — up to 82 %), while the share of open source solutions will remain 10 %, and foreign ones — 8 %.

According to the estimates of J'son & Partners Consulting, the share of foreign software products (Microsoft Office, Hancock Office, WPS Office, etc.) in the office software market in 2020 was 77.5 %, with 15.5 % share of the free software (LibreOffice and OpenOffice) and 7 % share of the Russian software ("MyOffice" developed by "New Cloud technologies", P7-Office and P7 solutions).

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Russian office software market based on the results of 2020–2021

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2020   ▬▬▬▬▬▬▬   RUB 38.85 bln

2021   ▬▬▬▬▬▬▬▬   RUB 42.5 bln (+9.3 %)

Source: J'son & Partners Consulting

1.1.3. Use of Internet Technologies

According to the Russian Electronic Communications Association (RAEC), the growth of the Runet economy has continued in 2020. The coronavirus pandemic not only did not impede this growth, but partly even has contributed to it (restrictive measures have positively influenced some segments of the Runet economy and have negatively influenced other segments). The volume of the e-commerce segment amounted to RUB 6.07 tln (+22 %). The Runet audience reached 97.4 million people, the mobile Internet audience — 89.5 million people. In general, the Runet economy in 2020 grew by 22 % to RUB 6.7 tln.

In 2021 the Russian economy as a whole began to recover and the negative impact of the pandemic came to naught. At the same time, its positive impact on e-commerce has persisted. As a result, the growth of the Runet economy amounted to 42 % (up to RUB 9.5 tln). Such a significant increase was provided primarily by online retail (it reached RUB 2.992 tln with an increase of 52 % over the year) and electronic payment services (RUB 2.547 tln, +42 %). At the same time, the volume of Internet sales of tourist services grew by only 5 % and amounted to RUB 352.3 bln, sales of services via the Internet increased by 28 % to RUB 1.26 tln. The marketing and advertising segment reached RUB 432.5 bln with an increase of 24 %.

The Runet audience has hardly increased over the year. It increased from 97.4 million people (79.5 % of the country's population) up to 97.5 million people (79.9 %). At the same time, 94 million people used Internet every day. The audience of mobile Internet has also slightly increased — from 89.5 million people (73.1 % of the population) up to 90.2 million people. (73.8 %).

According to analysts at the SlickJump advertising platform, in 2021 the share of

mobile traffic in Runet increased by 2 %, and in total, portable devices accounted for 83 % of all traffic last year. In March, this figure was 87 %, which is still the highest figure for Runet during the entire records period.

According to the Federal State Statistics Service (Rosstat), in 2020, online sales accounted for 3.9 % of retail sales in the Russian Federation against 2 % in 2019. At the end of 2021, this figure has reached 5.1 %. Thus, the share of e-commerce in two years has increased 2.5 times, which was largely facilitated by the COVID-19 coronavirus pandemic — people started to spend more time at home due to pandemic restrictions and to order goods on the Web.

The rules of international business are changing and are likely to crystallize in about three years. The world is shifting from being a global market towards regionalization – territorial associations of countries strengthened by economic relationships. Technological sovereignty will begin within "friendly" agglomerations, entire niches and markets will open up for Russian software. We are interested in the markets of the Middle East, Africa, South America, certain countries in Southeast Asia, however, regional competition with India and China will be high.

Igor Kalganov
CEO of Group T1

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1.1.4. Telecommunications Market

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The volume of the telecommunications market in Russia in 2020

Absolute value	Growth/ decline in 2021	Growth/ decline in 2020	Growth/ decline in 2019	Source
RUB 1.8 tln (USD 24.42 bln)	+3.2 % (+1.8 %)	-0.7 % (-10.5 %)	+2.1 % (-0.4 %)	TMT Consulting

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At the end of 2021 the volume of the Russian telecommunications services market, according to TMT Consulting, grew by a record 3.2 %. In the previous few years, this market either showed slight contraction or small growth (for example, the 2.1 % increase in 2019 was mainly due to tariffs revisions, and there was a 0.7 % reduction in 2020).

According to TMT Consulting, the number of subscribers (active SIM cards) of mobile communications in Russia increased in 2021 by 3.3 % to 259 million, approaching the level of 2019 (260 million). Penetration was 178 %. In absolute terms, the subscriber base grew by 8 million — this is the highest figure in the last 5 years. This growth was facilitated by the relief of "stay-at-home" restrictions, which ensured the influx of visitors to telecom stores, as well as the partial restoration of the number of labor migrants, which traditionally form a noticeable share of customers of Russian operators.

Mobile revenues in 2021 increased by 4.4 % compared to 0.9 % in the previous year. In addition to the growth of the subscriber base, this was facilitated by an increase in roaming revenues due to an increase in outbound tourism. A significant increase in revenues from additional services in the B2B segment formed another growth factor.

According to TMT Consulting, broadband Internet penetration in 2021 was 61

%. The subscriber base grew by 0.8 %, and revenues grew by 3.0 %. The B2B segment had a significant impact on the growth of the broadband Internet access market in 2021 due to the connection of the third stage of socially significant facilities. An additional positive factor was the recovery of the "small and medium entrepreneurship" sector from the negative consequences of "stay-at-home" restrictions introduced in 2020.

Tariffs revision also had an impact, though a slight one, on the market growth. For example, the cost of wired Internet has increased (an increase was up to 15 %).

A more significant impact on the change in the cost of services and on the volume of the entire telecommunications market may appear at the end of 2022. For example, at the beginning of the year mobile operators have raised tariffs by about a 10 %.

According to Svyaznoy, the volume of the Russian smartphones market in 2021 amounted to 29.4 million units, showing a decrease by 7 % compared to 2020. Sales of these devices in the country have dropped for the first time since 2017. In monetary terms, the smartphone market in Russia in 2021 reached RUB 751.1 bln, which is 28 % higher than the result of a previous year. Analysts rationalize the increase in revenues with a decrease in quantitative

supplies by an increase in the average price of the gadget for the year by 38 %, to 25.5 thousand rubles. The decline of the Russian market in physical terms is related to its oversaturation. Most people who wanted to buy new smartphones did this in 2020. In addition, people started to use one phone model for a longer period of time, for which reason they buy more expensive versions.

1.2. Russia and Russian Cities in the World IT Ratings

The study of the way in which Russia as a whole and Russian cities and companies are represented in various ratings, in analysts' reports and in foreign English-language media, is no longer very relevant after the start of a special military operation in Ukraine. Until the beginning of 2022, there was some bias among the drafters of ratings, foreign analysts and journalists, who were still noting some Russian achievements, which to a greater or lesser degree has fostered the promotion of the solutions of Russian high-tech companies or the development of the infrastructure in Russia.

After the start of a special military operation, one cannot count on any partial objectivity in the representation of Russia abroad. For this reason most of the achievements that were reflected by the drafters of ratings and by foreign analysts in previous years can only be recollected. At the same time, some analysts continued to study Russia after the start of a special military operation.

There were no significant changes in the position of Russia in world ratings in recent years. It is worth noting the continued rise in the Doing Business rating in 2020, which can be considered the most important among all world ratings. However, in 2020 in most cases a slight slide to somehow lower positions was observed, and in 2021 a slight increase was more often recorded. Apparently, the general negative information background regarding the state of affairs in Russia produces its adverse effect, and this affects the drafters of ratings.

At the same time, any change in Russia's position in world ratings bears a tenuous relation with real changes. Long-term observations allow to determine the following pattern:

the position of Russia in the rating is the higher, the less subjective expert assessments are taken into account during rating drafting. For this reason the reduction or the increase in the rating of Russia primarily reflects the way Russia is treated abroad. This is also important, but it is not worth judging by the positions in the ratings about the real situation in a particular area of activity in the country.

At the request of the Ministry for Digital Technology, Communication and Mass Media of the Russian Federation RUSSOFT has conducted in March 2020 interviews of the members of the Association to gain an understanding of the way the position of Russia in the world ratings affects their business (promotion of software products and custom software development services abroad). No examples have been identified that such an influence exists. Most often, respondents answered categorically — they never encountered the fact that positions of Russia in different ratings has exerted any positive or negative influence during contracts conclusion.

Only ratings and analyst reports on specific companies or their products can be relevant for companies (in particular, Gartner and IDC, Forrester Research reports and the rating compiled by the Association of Outsourcing Professionals). There are a lot of companies in the world market whose affiliation with a particular country is difficult to determine. This is why most often the consumer focuses on the brand. In most cases, the country of origin of the company is of absolutely no interest for customers, unless it is about state purchase contracts. In these cases, over the past 7 years (since the events in Ukraine), the geopolitical aspect has influenced the decision to purchase Russian software.

According to the answers of respondents, the following conclusion could be drawn (it is available in the answer of one of the respondents): "We should welcome Russia's progress in these ratings, but only due to the real development in the relevant areas. It is necessary to monitor these ratings, but at the same time we should account for their conventionality, and should not lock ourselves into on them".

However, it is not just about the events in Ukraine and the attitude towards Russia. In 2022 many ratings have lost their relevance since no fairness is any longer possible at these ratings compilation. For example, how can business conditions in the US and the EU be positively assessed if unprecedented political pressure is exerted on companies? At the same time, not only foreign companies (Chinese, Russian) operating in the markets of America and Europe, but also local companies start to be under the pressure of politicians. The situation is aggravated by the fact, that the scope of what is allowed has become incomprehensible. The drafters of ratings, apparently, do not risk to objectively evaluate the conditions for doing business in Western countries, for fear of political and economic pressure. If you adapt to Western politicians, then there will be no confidence in the ratings being compiled — their existence loses any meaning.

Perhaps for this reason, the World Bank has stopped publishing the Doing Business index. This decision became known in September 2022. The representatives of the bank explained it by the fact that errors were spotted in the preparation of previous studies. It is possible that the objectiveness of the drafters of the Doing Business index, who have ranked Russia and China too high, was recognized as a mistake (ranking 28 and 31, respectively, in 2020).

New versions have not appeared in many other well-known ratings of countries. Consequently, the drafters of ratings, too, probably could not find a compromise between the objectiveness and the pressure exerted by politicians.

Changes in the position of Russia in the ratings of countries with respect to their competitiveness, innovation and the use of ICT

No.	Rating name	Year/place of Russia in the rating (↑ or ↓ relative to the previous version)							
		2015	2016	2017	2018	2019	2020	2021	2022
Competitiveness and Business Conditions									
1.	Doing Business	62 (↑)	51	40	35	31	28	—	—
2.	The IMD World Competitiveness Yearbook	45 (↑)	44	46	45	45	50	45	—
3.	The best developers (ranked by average score across all HackerRank Challenges)	—	—	2	—	—	—	—	—
Innovation and Use of ICT									
4.	Bloomberg Innovation Index	14 (↑)	12	26	25	27	26	24	—
5.	Global Innovation Index	48 (↑)	43	45	46	46	47	—	47
6.	E-Government Development Index	—	35 (↓8)	—	32	—	36	—	—
7.	UN Global Cybersecurity Index (GCI)	—	—	10	—	26	—	5	—

Positions of Russia in Several Other Ratings

In 2021 Russia ranked 10th in the rating of countries with the most stable segments of the national Internet (according to Qrator Labs, the specialist company in network security), rising by 3 positions over the year. At the same time, the maximum percentage of possible networks failures in the Russian Federation increased from 5.08 % to 5.15 %. This means that a larger number of networks in the Russian Federation will lose availability when a national telecom operator fails.

According to the Swiss business school IMD, in 2021 Russia rose one position in the ranking of digital competitiveness of countries, taking the 42nd place in this rating. The same school compiles ratings of countries' competitiveness (not only in the digital sphere). Russia ranks 45th in this rating.

At the same time, according to data from the European Center for Digital Competitiveness, released in early September 2021, Russia's digital competitiveness has decreased by 67 points over three years.

In 2021 Russia ranked 25th among 120 countries included in the study in the world Inclusive Internet Index. This index was published by the analytical division

of the British Economist magazine — The Economist Intelligence Unit.

According to the Center for Innovation in the Financial Sector of the Skolkovo Foundation, published in November 2021, Russia ranked first in the world in the use of mobile proximity payments. The penetration rate of mobile proximity payments in Russia was 78 %. In terms of penetration of fintech services Russia ranks third in the world with a level of 82 %, trailing only India and China.

In the fall 2021 it became known that Russia ranked 19th in the reputable "Top500" rating of supercomputers with the new "Chervonenkis" computer by Yandex. For the first time in a long time, Russia was in the top twenty in this rating. In total, seven Russian supercomputers are listed in the rating — three by Yandex, two by Sberbank and one by MTS and by Moscow State University. In terms of the number of supercomputers listed in the Top 500, Russia ranks 10th.

1.2.1. City Ratings

Innovation Cities Global Index 2018

In 2018, 500 cities from all over the world were among the participants in the Innovation Cities Index rating of the most innovative cities in the world. The rating allows to determine the potential of participants in the field of innovative ideas development, introduction and translation. Cities are evaluated on 162 special indicators, including: development of market relations, investments in technological progresses, entrepreneurial climate, levels of science, education, health and culture development, as well as levels of sports, financial and information and communication infrastructure of the city. 2015 — was the year of the rise of Russian cities, while 2017 was unsuccessful for all cities (except Moscow): city ratings literally collapsed, losing from 27 to 152 positions. In 2018, the decline in ratings affected all Russian cities, including the capital. In 2019, only a few Russian cities (including Moscow) improved their positions.

There seems to be no reason for such a reduction in the ratings of almost all Russian cities, since economic problems should not greatly affect the development, introduction and translation of innovative ideas. The changes taking place in Russia during the last 3 years have influenced innovation both negatively and positively, since the same economic crisis often forced companies and government structures to become more innovative.

In 2021, 15 cities out of 20 Russian cities included in the rating have improved their positions, and 5 showed a decrease (usually very small).

At the beginning of autumn 2022, a new version of this rating was not presented.

Most Promising Cities in Terms of Investments in Technology, Innovation and Startups

According to the Tech Cities of the Future rating, Moscow was among the TOP-20 most promising cities in Europe in 2020. Cities were evaluated in terms of raising capital, the availability of qualified employees and infrastructure development. The five leading cities included London, Paris, Dublin, Amsterdam, Berlin. The overall rating was formed based on the results the cities have scored in each of the five categories — Economic Potential, Innovation and Attractiveness, Level of Foreign Direct Investments, Startups Ecosystem and Profitability. The Russian capital ranked 18th among 76, and in one of the five categories of the rating ("Startups Ecosystem") it raised to the 10th line.

In 2021, Moscow moved up 14th place in the overall rating, and to the 6th place in the "Startups Ecosystem" ecosystem.

A new version of 2022 did not appear by the time of this chapter preparation.

Best Ecosystems for Startups (StartupBlink)

StartupBlink ranks not only the country, but also the city in the segment it studies. In the StartupBlink rating presented in 2021 Moscow retained 9th place it took a year earlier, and Saint-Petersburg moved down from 147th place to 199th. The positions of Novosibirsk (400th place, moved down 34 positions), Kazan (428th, 87 positions lost), Chelyabinsk (637th place, loss of 11 positions) and Yekaterinburg 680th place, loss of 138 positions) also worsened. Kaliningrad moved up 289 positions to 610th place, Tomsk — 272 positions to 677th.

In 2022, Russia as a whole in this rating moved down by 12 positions to 29th

Changes in the positions of Russian cities in the Innovation Cities Global Index rating, place

Name of the city	2015 (↑ or ↓ relative to the previous version)	2016–2017	2018	2019	2021
Barnaul	—	446	467	476	469
Vladivostok	367 (↑14)	415	439	447	428
Volgograd	365 (↑13)	432	436	444	401
Yekaterinburg	220 (↓7)	358	402	416	385
Izhevsk	400 (↓6)	454	466	482	455
Kazan	223 (↓1)	339	375	393	366
Kaliningrad	303 (↑11)	397	426	437	404
Krasnoyarsk	280 (↑23)	412	443	438	437
Moscow	45 (↑18)	43	48	38	34
Nizhny Novgorod	273 (↑9)	388	421	421	423
Novosibirsk	244 (↑9)	394	416	405	406
Omsk	362 (↑9)	421	441	449	439
Orenburg	406 (↑1)	448	473	473	454
Perm	340 (↑14)	419	440	441	450
Rostov-on-Don	289 (↑28)	392	425	419	425
Samara	282 (↓16)	434	427	440	421
Saint-Petersburg	48 (↑33)	75	93	109	121
Saratov	341 (↑14)	437	456	463	448
Togliatti	407 (↑1)	455	474	475	465
Tomsk	339 (↑4)	444	462	460	452
Total cities in the rating:	442	500	500	500	500

place, and this happened despite the fact that the drafters of the rating have acknowledged the progress of the country in the development of an ecosystem for startups. They responded to the start of a special military operation, which, in their opinion, does not contribute to the emergence and development of new high-tech companies.

At the same time, Russia was represented in this rating by 9 cities (in terms of this indicator, Russia ranks 17th): Petersburg (237th place), Kazan (555), Novosibirsk (589), Kaliningrad (772), Chelyabinsk (839), Tomsk (854), Ulyanovsk (861).

In the fall 2021 it became known that Moscow took second place in the Global ICT Excellence Awards contest in the Startup Ecosystem nomination.

The World's 100 Best Cities (for living and business activities)

In October 2020, the Resonance Consultancy consulting company specializing in the field of real estate and economic development announced a new edition of the rating of the best cities in the world for living, business and tourism (The World's 100 Best Cities). Moscow ranked fourth against the fifth line a year earlier. The authors of the study noted Moscow's leadership in the "Product" category, again recognizing it as the best judging by such parameters as infrastructure (in particular, a network of airports), cultural sites and attractions.

In addition, the capital of Russia entered the top three megacities in the "Place" category, which analyzes the quality of the urban environment and safety. The city also improved its position in the "People" category, moving up in this category from the 143th place to the 12th place only in a year. Moscow ranked second in the world in the number of residents with higher education.

St. Petersburg was also included in the rating, and ranked 16th in 2020 (this Russian city took 35th place in the previous list).

In 2021 Moscow retained the 4th place. St. Petersburg moved down to the 17th position.

1.3. Achievements of Individual Russian Companies and References of these Companies Global IT Ratings

It is difficult to draw an unambiguous conclusion in the last 4 years about the deterioration or improvement of the position of Russian companies in various world ratings. Some reduction in the representation of Russian software developers in world ratings and in analyst reports is largely due to the fact that a number of companies have changed their Russian jurisdiction to a foreign one. Reorientation to the Russian market and the markets of developing countries is also important for the drafters of ratings located in Western countries. At the same time, new Russian companies appeared

replacing some companies excluded from world ratings and analyst reports.

The Global Outsourcing 100

The International Association of Outsourcing Professionals (IAOP) has been compiling ratings of the best outsourcing companies in the world for 15 consecutive years.

The representation of Russia in the main IAOP rating in 2015–2021 changed slightly, while in the previous decade it gradually increased. In 2022, it sharply

decreased from six to two companies — Auriga and First Line Software. Apparently, getting into this rating has become irrelevant for other companies, as they have curtailed their activities in the markets of Western countries.

In some categories, other Russian companies can be noted by IAOP analysts. Reksoft is reportedly included in the Leader Judging Size category, which is awarded for meeting the highest international standards and for demonstrating the constant growth of professional expertise.

Russian companies in the The Best of The Global Outsourcing (The Global Outsourcing 100) rating in 2015–2021

No.	Name of Russian company	2015	2016	2017	2018	2019 (getting into the rating)	2020	2021	2022
1	Artezio	Rising Star	—	—	Rising Star	—	Rising Star	Rising Star	—
2	Auriga	Rising Star	Rising Star	Rising Star	Rising Star	+	Rising Star	Rising Star	Rising Star
3	Luxoft	Leader	Leader	Leader	Leader	+	—	—	—
4	MAYKOR	Leader	Leader	Leader	Leader	+	—	—	—
5	First Line Software	—	—	Rising Star	—	+	Rising Star	Rising Star	Rising Star
6	ICL Services	—	Leader	Leader	Leader	+	Leader	Leader	—
7	MERA	Leader	—	Leader	Leader	+	—	—	—
8	SimbirSoft	—	—	—	—	+	Rising Star	Leader	—
9	Reksoft	—	—	—	—	—	—	Leader	—

Magic Quadrants of Gartner

The ratings of the Gartner Group analytical agency, which annually compiles the so-called "Gartner Magic Quadrants" represent some of the most prestigious ratings for product companies (software manufacturers). They indicate the products and companies that are among the leaders in certain software segments.In 2021–2022, no new Russian companies appeared in the magic quadrant.

On May 5, 2022, Gartner informed Russian IT vendors of its withdrawal from the Russian market. The letter on this subject says that the decision to leave is associated with the current economic situation and the increasingly complicated conditions for doing business in the country. In its letter, Gartner states that it will no longer cover Russian-based vendors in its research. In addition, from April 11, the company will remove their products from Gartner Peer Insights, an online platform for ratings and customer reviews of software and IT services.

Apparently, after the departure of Gartner, Russian companies will seek to get into the reports of other research companies.

In 2022, the Russian company SPIRIT, the developer of the VideoMost videoconferencing product, is included in the spring G2 report with a map of video conferencing products. According to the analysis of user reviews, the VideoMost product rating is 4.5 out of 5. G2 is the largest international marketplace on which customers can compare and select products and services that most precisely meet their needs and business goals.

In January 2022 Kaspersky Lab is named a key player (Major Player) in the field of endpoint protection for large, medium

Russian companies in the magic quadrant of Gartner

Gartner Magic Quadrant Name	Year of publication	Company Name
Endpoint Protection Platforms	2021	Kaspersky
Enterprise Data Loss Prevention	2017	InfoWatch Zecurion SearchInform
Enterprise Backup and Recovery Software Solutions	2021	Veeam Acronis
Treat Intelligence	2014	Kaspersky Lab Group IB
Application Security Testing	2018	Positive Technologies (Leader)
Operational Technology Security	2016	Positive Technologies
Data Center Backup and Recovery Software/Solutions	2020	Veeam Acronis
Integrated Revenue and Customer Management for CSPs	2019	Nexign
Meeting Solutions	2020, 2021	TrueConf

and small businesses in two IDC reports (this company continued to operate in Russia in the fall of 2022).

In July 2022, it became known that, according to the results of a global study conducted by Forrester Research, Diasoft has confirmed its status of the leading supplier of banking platforms in Europe in terms of the total number of transactions in 2021, and also was ranked sixth in the list of world leaders in the banking platform market in terms of the number of repeated sales.

In January 2022, IFI Claims Direct named Kaspersky Lab the leader among those Russian companies that have been granted patents in the United States in

2021. According to the analytical report, 43 IT vendor patents were registered in the United States during this period. In total, Kaspersky Lab has received 412 US patents and more than 1,200 patents around the world, including Russia, the EU, China and Japan throughout its history.

In spring 2022, it became known that scientists from the Russian Quantum Center have patented a new architecture of a qudit-based quantum processor. It will increase the power of an ion based quantum computer, which was developed in the end of 2021. Only three states have similar developments: USA, China and Austria.
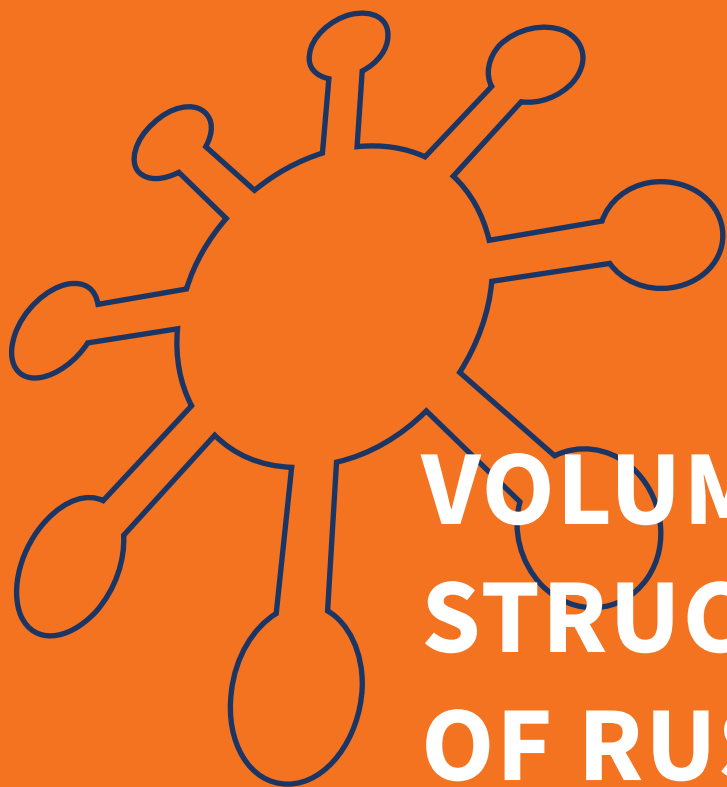
VOLUME AND STRUCTURE OF RUSSIAN SOFTWARE COMPANIES' SALES IN THE DOMESTIC MARKET AND ABROAD

2

VOLUME AND STRUCTURE OF RUSSIAN SOFTWARE COMPANIES' SALES IN THE DOMESTIC MARKET AND ABROAD

Sergey Ozhegov
SearchInform CEO, the Head of Export Committee in RUSSOFT

In terms of recent events, accelerating the growth of non-commodity exports, such as, IT-technologies is a crucial task. Markets of South-East Asia, Latin America, Africa and the Middle East has become a priority for the whole domestic ICT industry, and we are also presented there. Due to respectful and loyal attitude to Russian products, the emerging markets are open for us to operate. We need to invest as much effort, money, and other business and government resources as possible.

For a few years we've been closely cooperating with development institutes, in particular, with Russian Export Center, Ministry of Digital Development, Communications and Mass Media of the Russian Federation; participating in joint business missions, Intergovernmental Commissions on Trade, Economic, Scientific and Technical Cooperation; taking part in the development of legislation, aimed at the management of export activities; assessing current support measures.

Basing on our experience, we are able to identify efficient strategies. This is why the direct contact between state structures and business is required.

And that's how promotion tools with specific measurable result and understandable KPI are developed. I hope that geopolitical changes of this year will stimulate both government and IT-businesses to implement together a list of offers:

1. Create IT hubs abroad with the full-fledged infrastructure, as well as complex PR and marketing supplements. The main idea is not the promotion of a specific company, but the creation of "Made in Russia" brand for IT-solutions.

2. Involve vendor representatives in the implementation of "digital attaché" program, including the assessment of digital attaché effectiveness, regarding the KPI. Only employees of companies — operating abroad — know precisely, which skills and experience are required for promotion in a certain market. IT-companies should provide financial motivation for sales results with a percentage of transaction volume and assist in training applicants for a digital attaché position.

3. Structure sales system, with the focus on promotion of not only specific products and companies but platform

solutions instead. These solutions should include system and application software, as well as hardware. Creation and export of hardware and software system to developing countries implies establishing long-lasting relationship between states.

It's expected that the well-structured promotion of non-commodities exports program, which is in the process of development by Russian Export Center, the Ministry of Foreign Affairs of the Russian Federation, will include clear support measures approved by the IT-industry. Offers, aimed at effective allocation of budget funds, and support measures for non-commodity exports are relevant and require actions. I hope that in the nearest few years IT-vendors, industry associations, ministries and other stakeholder structures will concentrate efforts on the above mentioned measures.

2.1. Key indicators of the Russian software industry

According to RUSSOFT, at least 4.5 thousand stable companies professionally developing software operate in Russia (apart from startups and other enterprises without regular income). Annually, the number of software companies is growing by about 2–4%. According to this estimate, in 2021, at least 2.5 thousand companies conducted international business. Up to 3 thousand companies have experience in sales abroad, including in the near abroad. Each year, approximately 2–2.2 thousand companies received stable export income.

In the last few years, the share of companies with income from foreign sales, apparently, either hardly changed during the year, or decreased slightly. On the one hand, companies that previously worked only in Russia are beginning to enter foreign markets. On the other hand, companies that have insignificant export income (up to 10% of all revenue) have completely reoriented to the Russian market which is more attractive for them. This mainly applies to small companies that could not gain a foothold in the markets of Western countries (for more details, see

Chapter 4). The survey results suggest that the number of companies that have recently reoriented completely to the Russian market is slightly higher than the number of companies that began working abroad in 2021. The latest survey of software companies conducted by RUSSOFT in 2022 showed that 3.5% of companies with export revenues in 2020 had zero in 2021. At the same time, many companies had foreign sales in 2021 in the absence of export revenues in 2020.

According to the bank statements submitted to the Central Bank of the Russian Federation, in 2017, about 9 thousand companies received money for the "computer services" provided (explanations of what that means are presented below in Section 2.3.). In the same year, RUSSOFT assumed that the number of software companies that are exporters exceeds 2.2 thousand. However, the difference in the data of RUSSOFT and the Central Bank of Russia (2.2 thousand and 9 thousand, respectively) both in the number of exporting companies and in the total number of software enterprises is explained by the fact that the same company, as understood by RUSSOFT, can sell its services and solutions through several related legal entities. In addition, companies that cannot be considered software companies can receive income from "computer services," since software development is not their main activity.

Number of Russian software companies (RUSSOFT estimate)

Number of stable Russian software companies	4.5 thousand min.
Number of companies with export revenues	2.5 thousand min.

Total number of specialized employees as of the end of 2021, thousand persons

Software developers working in all industries (including IT services of enterprises of different business fields)	>720
Software developers working in the Russian software development industry (total), of which:	>225
- in development centers abroad	8-10
- in Russia	≈215
Employees of service companies (including those working for foreign customers)	≈115 (50)
Employees of product companies	≈89
Employees of Russian R&D centers of foreign companies	≈11

2.2. Sales volume of the Russian software development industry

The total turnover of enterprises in the Russian software industry amounted to ₽1.56 trillion in 2021, an increase of 19%. Revenues from exports and sales within Russia (in rubles) increased equally — by about the same 19%.

If we consider the growth rate of the total turnover of industry enterprises, then 2021 was one of the most successful for the software industry over the past decade. The increase in total revenues in dollar or ruble terms in some previous years was significant, but, as a rule, this growth was due to strong fluctuations in the ruble exchange rate against the dollar. In 2015, with an increase in total revenue in rubles by 40%, its drop was even recorded by 10%

in dollars. In 2017, it was the opposite — calculations in dollars showed an increase in total revenue by 19%, and in rubles — only by 4%.

In order to see the general trend, RUSSOFT calculates its own dual currency index (weighted average change in sales abroad in dollars and domestic sales in rubles). The indicator is far from perfect, since it does not take into account changes in the value of the ruble and the dollar associated with currency fluctuations. However, it does provide a general insight into the dynamics of the process. According to the dual-currency index, it can be seen that the software industry since 2014 (before RUSSOFT calculated only export revenues) has

1,56 **trillion RUB**

The total turnover of enterprises in the Russian software industry

been growing by at least 10% per year (such an increase corresponds to the 1.1 index), and in some years — by more than 20%. Consequently, the version is confirmed according to which the total revenue of industry enterprises, taking into account the dual-currency index of RUSSOFT, has growth limiters — a minimum of 10% and a maximum of 20% (or slightly more).

Increase in turnover and foreign sales of Russian software companies in 2014–2021

	2014	2015	2016	2017	2018	2019	2020	2021
Turnover, ₽	+25.5%	+40%	+27%	+4%	+19.5%	+17.8%	+16.5%	+19%
Turnover, $	+5%	−10%	+16%	+19%	+10.6%	+14.9%	+4.5%	+17%
Foreign sales, $	+11%	+12%	+13%	+16%	+10%	+17.5%	+4.3%	+17%

The lower bar was determined by the fact that the global need for software development is not fully met. Therefore, even in the absence of an increase in solvent demand in the domestic market, the industry can grow due to exports by at least 10%. The upper limit is determined by the personnel deficit. The staff of software companies can be increased by a maximum of 12–13%, which provides a turnover increase of about 20%. Product companies are less dependent on the number of software developers, but their development is limited by the presence of

those specialists on the market who can promote replicated solutions in various markets.

It can be noted that in the past 2 years, the growth rate of sales in the domestic market has equaled the growth rate of sales abroad (+19% in ruble terms). The convergence of these indicators means that a significant part of Russian software companies has learned to reorient from foreign markets to domestic ones or from domestic ones to foreign ones, responding to a change in demand.

The situation in the domestic market is also favorable for domestic software developers and has its impact as well. If in some years there was no significant expansion of it, then in 2022 foreign companies vacate a place on it (to a large extent due to the US sanctions policy and decrease in confidence in American and European software). In recent years, Russian software companies have been reorienting mainly from the markets of Western countries to the domestic market and the markets of "friendly" states (for more details, see Chapter 4).

Since the average annual dollar exchange rates in 2021 and 2020 differ slightly (73.7 rubles and 72.15 rubles, respectively), the growth indicators of the total turnover of Russian software enterprises, measured in dollars and rubles, in these years almost coincide (+17% and +19%, respectively).

Thanks to the database of software companies formed by the RUSSOFT Association with data on their revenue and staff, it became possible to check our estimates. This database contains information on the 2020–2021 revenue of 6,246 legal entities that specified their main activity as software development (OKVED (Russian National Classifier of Types of Economic Activity) code 62.0 and 62.01). According to the results for 2021,

the total turnover of these legal entities amounted to ₽881 billion ($11.952 billion), which is 19.6% more than a year earlier (+17.1%, if we compare the indicators in terms of dollars). Therefore, there is almost a complete match of the statistics data with the survey results. In this case, it is not mandatory, since in the formed database there are accounting indicators of not all legal entities with the OKVED (Russian National Classifier of Types of Economic Activity) code 62.0 or 62.01 (there is not enough information about the revenue of about 3 thousand companies). At the same time, RUSSOFT focuses on real revenues, including the one that remains abroad, and not on accounting indicators. The difference between an increase in the total accounting revenue of legal entities with

the OKVED (Russian National Classifier of Types of Economic Activity) code 62.0 or 62.01 and an increase in the real total turnover calculated using the RUSSOFT method may well be 2–3 percentage points. With a larger discrepancy, there will be a reason to doubt the accuracy of the calculations if this discrepancy has no explanation.

Data analysis of the formed database of companies allows you to check the absolute value of the total turnover of software industry enterprises. According to the financial statements, if the total revenue of 6 thousand out of 9 thousand legal entities developing software is ₽881 billion, then the real total turnover of all industry enterprises may well amount to ₽1,56 trillion.

The main economic indicators characterizing the Russian software industry in 2013–2018 (growth/decline compared to the same indicator of the previous year)

	units of measurement	2013*	2014	2015	2016	2017	2018
Total turnover of Russian software companies	₽	₽363 billion	₽456 billion (+25.5 %)	₽630 billion (+40 %)	₽802 billion (+27 %)	₽834 billion (+4 %)	₽997 billion (+19.5 %)
	$	over $11 billion	$12 billion (+5 %)	$10.34 billion (−10 %)	$12 billion (+16 %)	$14.3 billion (+19 %)	$15.82 billion (+10.6 %)
Volume of foreign sales	$	$5.4 billion (+17 %)	$6 billion (+11 %)	$6.7 billion (+12 %)	$7.6 billion (+13 %)	$8.8 billion (+16 %)	$9.68 billion (+10 %)
Share of foreign sales in total sales	%	49 %	50 %	65 %	63 %	62 %	61 %
Domestic sales volume	₽	₽178 billion	₽240 billion (+35 %)	₽220 billion (−8 %)	₽294 billion (+34 %)	₽321 billion (+9 %)	₽387 billion (+20.5 %)
	$	$5.6 billion	$6 billion (+7 %)	$3.64 billion (−39 %)	$4.4 billion (+21 %)	$5.5 billion (+25 %)	$6.14 billion (+12 %)
RUSSOFT dual-currency index		—	1.23	1.1	1.21	1.13	1.14

* — until 2013, RUSSOFT did not determine the size of the total turnover, therefore there is no data on the growth of turnover compared to 2012.

It is important to recall that since 2020, to summarize the results of the previous year, the Russian ruble (formerly the US dollar) became the base currency for calculating the financial indicators of companies in the RUSSOFT study. If until 2020 RUSSOFT collected information on the turnover of companies in dollars (the questions in the questionnaire were formulated accordingly) and made all calculations using them with the conversion of indicators into rubles at the average annual exchange rate, starting from 2020, the data is based on indicators in ruble terms, which are then additionally converted into dollars. This is done in order to enable a comparison of the Russian software development industry indicators at the international level.

In 2018, several large Russian companies immediately changed Russian jurisdiction to the jurisdiction of foreign countries, which led to the fact that they ceased to be considered Russian according to the RUSSOFT criteria. Accordingly, there was a decrease in the total volume of turnover and export of the entire industry. To avoid misunderstanding caused by an apparent discrepancy in sales volumes and growth rates in 2018 and 2019, a new table has been created to summarize the results since 2019. The changes in indicators specified therein apply only to the circle of companies that are still considered Russian (and were such in previous years). At the same time, despite the change in the absolute values of turnover associated with a change in the composition of respondents, a comparison of growth rates (reduction) for all the years of the study is quite justified (including in 2018 and 2019).

The main economic indicators characterizing the Russian software industry in 2019–2021 (growth/decline compared to the same indicator of the previous year)

	unit of measurement	2019	2020	2021
Total turnover of Russian software companies	₽	₽1.120 trillion (+17.8%)	₽1.305 trillion (+16.5%)	₽1.56 trillion (+19%)
	$	$17.34 billion (+14.9%)	$18.1 billion (+4.5%)	$21.17 billion (+17%)
Volume of foreign sales	$	$8.25 billion (+17.5%)	$8.6 billion (+4.3%)	$10.07 billion (+17%)
Share of foreign sales in total sales	%	47.6%	47.5%	47.5%
Domestic sales volume	₽	₽587 billion (+15.7%)	₽684 billion (+16.5%)	₽815 billion (+19%)
	$	$9.09 billion (+12.9%)	$9.5 billion (+4.5%)	$11.1 billion (+17%)
Change in total turnover of Russian software companies in rubles, including inflation	%	+14.4%	+11.1%	+10.1%
RUSSOFT dual-currency index	—	1.17	1.104	1.18

2.3. Foreign sales and export receipts

As of the end of 2021, the total foreign sales of software industry enterprises increased by 19% in ruble terms and by 17% in dollar terms. As a result, export revenues from Russian software companies exceeded $10 billion.

Foreign sales in 2003–2021 (year-on-year increase)

2003	2006	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019*	2020*	2021
$0.53 billion (+55%)	$1.41 billion (+49%)	$3.3 billion (+20%)	$4 billion (+22%)	$4.6 billion (+13%)	$5.4 billion (+17%)	$6 billion (+11%)	$6.7 billion (+12%)	$7.6 billion (+13%)	$8.8 billion (+16%)	$9.68 billion (+10%)	$8.25 billion (+17.5%**)	$8.6 billion (+4.3%)	$10.07 billion (+17%)
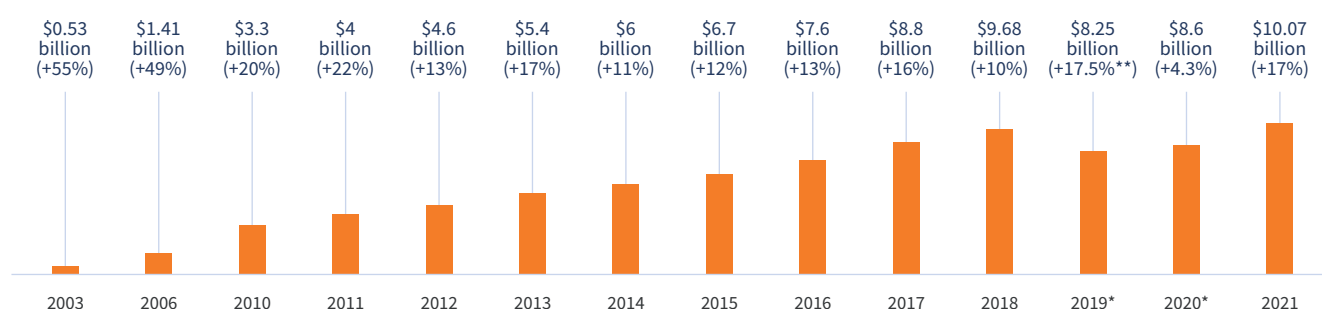
* — it is incorrect to correlate the absolute values of 2018 and 2019 in this case, taking into account the fact that some companies ceased to be considered Russian
** — growth only for companies that are still Russian (excluding those that have lost this status)

If in 2019 there were no sales of a number of Russian software companies (Luxoft, Parallels, Transas, Auriga, MERA) to foreign partners, then the total volume of foreign sales of the IT industry in 2019 would exceed $11 billion, and by the end of 2021 — $13 billion.

Foreign sales of software companies should not be confused with their export revenues from the sale of software and services for its development. Each of these terms has a corresponding quantitative measurement. There are three different indicators of the activity of software companies abroad:
— total volume of foreign sales,
— export volume of "computer services",
— volume of export receipts.

Their difference from each other may well be very significant.

The computer services export volume is determined by the Central Bank of Russia on the basis of information received by the Central Bank of Russia from banks for the corresponding OKVED (Russian National Classifier of Types of Economic Activity)

classifier group. As of the end of 2020, their volume increased by 13.5% to $5.094 billion, which is 59% of the total foreign sales of Russian software companies. As of the end of 2021, this figure reached $6.35 billion, an increase of 24.7% over the year. As a result, the volume of exports of computer services (according to the Central Bank of the Russian Federation) began to account for 63% of foreign sales of Russian software companies (according to RUSSOFT calculations).

The difference between the two indicators is shrinking. In 2019, this was primarily due to the fact that several large companies as a result of the change of ownership ceased to be considered Russian (they left a significant part of the revenue abroad). In addition, the average salary of software developers in Russia in 2020 began to increase faster than in previous years, and during the pandemic, there was no opportunity to conduct foreign marketing campaigns. Nevertheless, the difference between the two indicators (export of computer services and foreign sales of software companies) is still high. It raises questions

and confusion but has a completely logical explanation.

Clarification of the Central Bank of Russia

Foreign trade statistics on "computer services" is developed on the basis of the international methodology set out in the "Manual on Statistics of International Trade in Services, 2010", UN. Computer services include operations related to creation and implementation of software: development, creation, delivery and provision of documentation for custom software; purchase of ready-made software supplied by electronic means; purchase of software licenses without the right to reproduce or distribute.

In addition, this category of services includes works related to data processing, creation, recovery, hosting, storing and working with databases; services for development, design and placement of web pages on the server; services for

installation, repair and maintenance of computer equipment and software; provision of consulting services related to software and functioning of computer equipment, as well as training within consulting. The main sources of information in generating foreign trade statistics of the Russian Federation for services are the information contained in the reports of credit institutions approved by the Bank of Russia.

"Foreign sales of software companies" and "export of computer services" are two completely different indicators that should not be equal. Firstly, software

companies receive income not only from computer services, but also through the sale of software licenses when selling software and hardware systems, when selling advertising (in free applications), various non-computer services, conducted scientific research. Secondly, companies transfer the proceeds from the sale of their software abroad to Russia not only using the codifier "provision of computer services", but also as "payments for the use of intellectual property", "transfers to individuals" or "investments". It is known that two large Russian software companies successfully operating abroad are not among the top 10 exporters of

computer services, but they are in the top 10 in the section "Payment for the use of intellectual property". Thirdly, a significant part of the revenue received is not transferred to Russia. Some of the money remains with legal entities created by Russian companies in other countries in accordance with world practice in order to be closer to the client (in the conditions of modern geopolitics, this practice becomes especially relevant). It can be directed to marketing, to the maintenance of its own foreign development centers and sales offices, as well as remain in the bank accounts of the owners.

Comparison of computer services export volume (statistics of the Central Bank of Russia) and foreign sales volume of software companies (RUSSOFT calculation)

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Foreign sales of Russian software companies (RUSSOFT data)	Absolute value, $ billion	4	4.6	5.4	6	6.7	7.6	8.8	9.7	8.25*	8.6	10.07
	Annual change	+22%	+13%	+17%	+11%	+12%	+13%	+16%	+10%	+17%	+4.3%	+17%
Export of computer services (according to the Central Bank of Russia)	Absolute value, $ billion	1.666	1.995	2.508	2.651	2.455	2.664	3.417	4.06	4.49	5.094	6.35
	Annual change	+30.9%	+19.7%	+25.7%	+5.7%	−7.4%	+7.7%	+28.3%	+18.8%	+10.5%	+13.5%	+24.7%
Share of "computer services" export (Central Bank data) in foreign sales of software companies (RUSSOFT data)		42%	43%	46%	44%	37%	35%	39%	42%	54%	59%	63%

* — it is incorrect to correlate the absolute values of the total foreign sales volume of 2018 and 2019 in this case, because the indicator of 2019 was calculated using the changed methodology, taking into account the fact that some companies ceased to be considered Russian.

2.4. Comparison of foreign software sales and export of other goods and services

In 2021, there was no increase in the software exports share in the total exports of all Russian enterprises. It even decreased from 2.3% to 1.8% with a quite decent increase in foreign sales of Russian software companies (by 17%). A similar change was expected in mid-2021, because by this time oil prices had recovered, and experts predicted their further growth until the end of the year.

The change in the share of software enterprises in the total export volume must be looked at through data analysis for 5–10 years. If we take the last 20 years, this figure has almost always been growing, although in some years growth stopped due to a sharp increase in all Russian exports. In 2002, this share was 0.3%, and in 2016 and 2020 it reached a record value of 2.3% (for "computer

services" for the period from 2002 to 2020, it increased from 0.1% to 1.3%).

As of the end of 2019, the share of software companies' exports in the total export volume was lower than a year earlier (1.7% versus 1.9%), but this was only due to the fact that some software companies ceased to meet the criteria by which they were considered Russian

Comparison of foreign sales volume of software companies with total export of goods and services of the Russian Federation, $ billion

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Export of services of the Russian Federation (Central Bank of the Russian Federation)	58.04	62.34	70.12	65.74	51.7	50.55	57.8	64.8	62.8	46.9	55.95
Export of goods of the Russian Federation (Central Bank of the Russian Federation)	515.41	527.43	521.84	496.81	341.42	281.85	352.3	443.1	414.3	332.2	491.6
Export of goods and services of the Russian Federation	573.45	589.77	591.96	562.55	393.12	332.4	410.1	507.9	477.1	379.1	547.5
Growth/decrease in exports of goods and services for the year	+29.8%	+2.8%	+0.4%	-5.0%	-30.1%	-15.4%	+23.4%	+23.8%	-6.1%	-20.5%	+44.4%
Foreign sales of software companies according to RUSSOFT (annual change)	4 (+22%)	4.6 (+13%)	5.4 (+17%)	6 (+11%)	6.7 (+12%)	7.6 (+13%)	8.8 (+16%)	9.68 (+10%)	8.25 (+17.5%)	8.6 (+4.3%)	10.1 (+17%)
Share of foreign sales of software companies in total exports of the Russian Federation	0.7%	0.8%	0.9%	1.1%	1.7%	2.3%	2.1%	1.9%	1.7%*	2.3%	1.8%
Export of computer services according to the Central Bank of the Russian Federation (annual change)	1.7 (+30.9%)	2 (+19.7%)	2.5 (+25.7%)	2.7 (+5.7%)	2.5 (-7.4%)	2.7 (+7.7%)	3.4 (+28.3%)	4.1 (+18.8%)	4.5 (+10.5%)	5.1 (+13.5%)	6.35 (+24.7%)
Share of computer services in total exports of the Russian Federation	0.3%	0.34%	0.42%	0.48%	0.64%	0.81%	0.83%	0.81%	0.94%	1.3%	1.2%

Source: Statistics of the Central Bank, RUSSOFT (only data on foreign software sales and calculation of shares)
* — decrease in the share is due to the fact that some software companies ceased to meet the criteria by which they were considered Russian

in our study. If we included them, the volume of foreign sales would exceed $13 billion in 2021, and the share of the software industry in the total export of goods and services would be approximately 2.5%. As a result, the volume of foreign sales of software companies could already be compared with arms exports, which amounted to $13.9 billion in 2021.

The comparison of data for all exports and for foreign software sales in this case is quite justified. If you focus only on the statistics of the Central Bank, it will be impossible to explain the significant fluctuations in data on computer services (which is natural, since the data of the Central Bank reflect only a part of foreign sales of Russian software companies).

Whatever the reasons for the change in the share of software exports, the undeniable fact is that foreign software sales have become much more significant in foreign economic activity of Russia in recent years than 10–15 years ago.

Exports of essential goods in 2016–2021

	Share in total exports of goods and services of the Russian Federation					
	2016	2017	2018	2019	2020	2021
Foreign sales of software companies	2.3%	2.1%	1.9%	1.7%	2.3%	1.8%
Food and agricultural raw materials	5.1%	5.05%	4.9%	5.2%	7.8%	6.7%
Grain (cereals)	1.7%	1.8%	2.06%	1.7%	2.6%	2.1%
Wood and pulp and paper products	2.9%	2.9%	2.7%	2.7%	3.2%	3.1%
Chemical industry products, rubber	6.3%	5.8%	5.4%	5.7%	6.3%	6.9%
Machinery, equipment and vehicles	7.3%	6.9%	5.7%	5.8%	6.6%	6.0%
Arms (source — Center for Analysis of the World Arms Trade)	4.5%	3.4–3.7%	≈3.1%	3.0%	4%	2.5%

For the last 10 years RUSSOFT has been comparing the volume of foreign sales of software companies with the export of various essential goods. This is done to assess the importance of the industry to the economy. It is assumed that this comparison is conditional, since the value of exports depending on the group of goods or services can have a completely different impact on the country's economy.

An added value indicator is also important, which is very high for the software industry, since the labor costs of software developers in total costs are 50–

80% (on average about 70%). In addition, in the commodity sector, a significant part of export income is provided by imported equipment and natural rent. In agriculture, exports depend not only on the work of farmers, but also fertile land, foreign equipment and imported seeds.

The comparison of foreign software sales volume with the export of other industries has been criticized for several years, since RUSSOFT calculations made on the basis of market participants survey are compared with official statistics. However, the calculated data on foreign sales of software companies is

quite consistent with the official statistics of the Central Bank on computer services, as shown above. Critics' proposal to exclude that part of the revenue of software developers that remains abroad from calculations is not entirely correct, given the specifics of computer services provision. In addition, other industries also bear costs for promotion, for participation in exhibitions, for the maintenance of foreign representative offices, have deposits in foreign banks, which are not deducted from their export revenue in calculations.

2.5. Domestic sales

Sales in the domestic market of Russian software companies amounted to ₽815 billion in 2021, which is 19% higher than in 2020. Service companies increased sales in Russia by 22% to ₽295 billion, and product companies — by 18% to ₽520 billion.

Since it is known what the approximate share of companies is for the actual custom development (about 70% for service and up to 20% for product companies), we can estimate the volume of orders for software development that Russian companies received in Russia. As of the end of 2021, this volume amounted to ₽260–300 billion, having increased by 20–21% over the year.

Similar calculations can be made regarding domestic software products

sold in Russia. Service companies also develop them, but in their total turnover they amounted to 8.7% in 2021 (in the previous few years from 6.3% to 8.3%). The main direction for product companies is 75% sales in the domestic market (in previous years — 70–72.5%). As a result, sales of domestic software products within Russia amount to ₽390–415 billion (growth over the year by 20–28%). In total, sales of custom software and software products in 2021 reached ₽650–715 billion. The difference between this indicator and the total sales of service and product companies (₽815 billion) is the implementation of software as part of software and hardware systems, revenues from various IT services, including SaaS, and other sources of revenue.

415 billion RUB

Sales of domestic software products within Russia

Sales volume of Russian software companies in the domestic market in 2013–2021

₽178 billion	₽240 billion (+35%)	₽220 billion (-8%)	₽294 billion (+34%)	₽321 billion (+9%)	₽387 billion (+20.5%)	₽587 billion (+15.7%)	₽684 billion (+16.5%)	₽815 billion (+19%)
2013*	2014	2015	2016	2017	2018	2019**	2020	2021
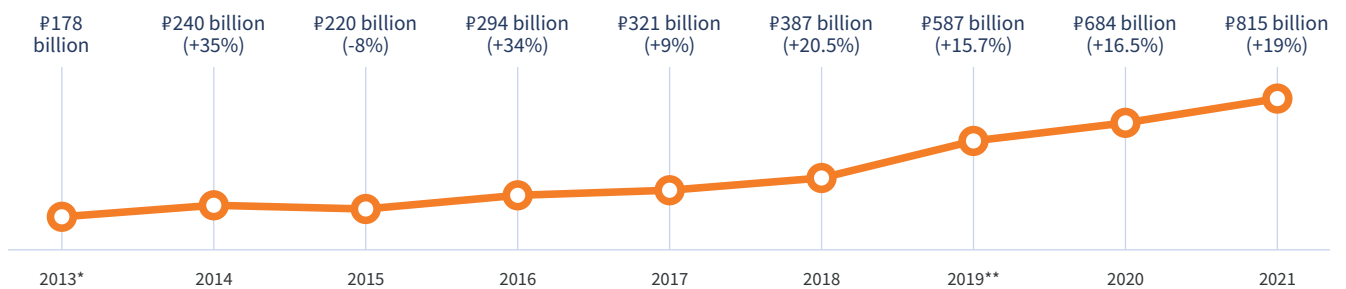
* — until 2013, RUSSOFT did not determine the amount of total turnover and sales within Russia, therefore there is no data on sales growth compared to 2012.

** — it is incorrect to correlate the absolute values of 2018 and 2019 in this case, because the 2019 indicator was actually calculated again using a slightly changed methodology and based on more complete data.

2.6. Forecast of changes in the main indicators of the software industry

In recent years, companies' expectations for growing turnover and exports have become too high. Real growth figures were 5–10 percentage points below forecast. The exception is 2019, when the forecast for the growth of total turnover was 100% correct.

In 2020, due to the pandemic, the situation turned out to be such that by the second half of March it became pointless to make any forecasts regarding the results of the entire year, therefore, with the survey launched at the end of February, some of the questions regarding plans for the current and next year became superfluous. By June, you could only count on a slight increase at the end of the year. At the same time, the pessimistic scenario remained relevant, and it suggested a significant reduction in sales.

In 2021, the situation in the global economy became more predictable for making a forecast of software sales both in Russia and abroad based on the expectations of the surveyed companies. According to this forecast, the growth rate of turnover in 2021 should increase compared to 2020 — from 16.5% to more than 20%, and the total turnover should have exceeded ₽1.6 trillion. If the average annual dollar exchange rate is about 75 rubles, which can be expected, then in dollar terms this figure will be more than $21 billion.

Software companies rely more on the domestic market (on the growth of the entire economy, on digitalization and import substitution processes). Its sales are much easier to predict than to predict exports with unclear prospects for traveling abroad due to the declared pandemic. As of the end of 2021, the surveyed companies were extremely cautious about export volume. The vast majority of them expect that it will not change even in ruble terms. Most likely,

such an expectation in most cases is similar to the answer "Don't know". Therefore, foreign sales growth in the forecast based on the expectations of the surveyed companies will increase by only 13% (that is, less than in 2020). In dollars, the increase will be about 9% — up to $9.3 billion.

We can assume that the forecast was justified relative to the total turnover in 2021. Although this figure fell short of ₽1.6 trillion, in this case, the deviation from the expected value is insignificant.

The forecast for foreign sales reflected the overly cautious expectations of the surveyed companies. Instead of the estimated growth of 9% (in dollar terms), the real increase turned out to be much more significant — by 17%. Exports of computer services increased even more — by almost 25%.

In the spring of 2022, when conducting a survey as part of the annual RUSSOFT study in conditions of very high uncertainty, it made no sense to ask representatives of software companies about sales plans for the entire current year. Therefore, companies' forecasts for expected turnover and export were requested only for the first half of 2022.

Judging by the data of the surveyed companies, the projected increase in their total turnover in the first half of 2022 compared to the same period of the previous year is +16%, and exports — +14%.

Judging by the mood of the RUSSOFT Association members observed in July, you can extend this forecast for the entire year. However, you can't extrapolate it to the entire industry, as it was done in previous years. The fact is that a number of large companies, which received most of the income from working in the markets of Western

The demand for IT solutions within the country has increased drastically due to strategic import substitution and the fact that the use of Western software decreased by 2 orders. This motivates IT market actors to launch software development programs. The availability of labor and financial resources, that are used to ensure sufficient investment in development, attract the best engineers and provide marketing support is listed among the most important success factors for developers, in addition to expertise and participation in large-scale projects.

Igor Kalganov
CEO of Group T1

countries, decided to completely close their offices in Russia, having arranged the relocation of their employees abroad. Russian software development centers of foreign companies have ceased to work. Many companies operating in the markets of developed countries ("unfriendly" countries) were forced to transfer sales centers from Russia to neighboring jurisdictions in order to avoid sanctions, keep customers and be able to receive payment in foreign currency. These categories of companies did not participate in the survey conducted by RUSSOFT.

Summing up 2022, it will be necessary to exclude data from those companies that cannot be considered Russian anymore, as well as data from closed R&D centers of foreign corporations, if not for the whole year, then for 6–8 months. To do this, you will have to deal with each such company separately, which can be done, since there

are not too many of them. It is possible that some of them only announced their departure from Russia, but continued to work in Russia in a different legal form.

Previously, it can be assumed that the total foreign sales of Russian software companies in 2022 will be lower than the previous year. Export revenue of those companies that can still be considered Russian enterprises is likely to decrease by 10–15% in dollar terms. At the same time, we can expect that the computer services export volume (according to the Central Bank of Russia) in 2022 may decrease significantly (several times) due to anti-Russian sanctions and transfer of sales centers of Russian exporters to other jurisdictions. At the same time, sales of all domestic software companies in the domestic market will increase by at least 15–20% in ruble terms. Thus, the total turnover of industry enterprises, despite significant personnel losses from

specialists traveling abroad (up to 15–20 thousand people), will not fall critically, but will increase by 5–10% in ruble terms.

All these forecasts suggest that there will be no new economic shocks before the end of the year, although they cannot be ruled out. The question is even acute about the use of an alternative dollar and euro currency for settlements, including the use of digital currencies (issued by the state) and even cryptocurrencies. It is unclear whether the US dollar will change dramatically against the currencies of other major countries. It can be assumed that all of them will depreciate following the dollar, confidence in which is lost, but which may hold out for some time as the main currency for international trade. In such a situation, the use of forecast values of sales and export earnings in ruble terms does not look like the worst option.

2.7. Nature of changes in company turnover

**Change in annual turnover of respondents' companies
(until 2019 in dollar terms, and since 2019 in ruble terms)**

Turn	as of the end of 2014	as of the end of 2015	as of the end of 2016	as of the end of 2017	as of the end of 2018	as of the end of 2019	as of the end of 2020	as of the end of 2021
Unchanged	26%	4%	30%	27%	13%	4.2%	5.3%	12.3%
Increased	51%	25%	42%	43%	52.5%	69.4%	62.6%	67.8%
Decreased	15%	71%	11%	3.5%	15.5%	18.1%	15.1%	6.4%
Don't know	7%	14%	17%	26.5%	19%	8.3%	17%	13.5%

As of the end of 2019, the turnover indicator was measured in rubles (in previous years — in dollars), and the Russian national currency depreciated slightly against the dollar over the year. This is partly why there are more growing companies on the market. However, this factor was not the main one, 2019 for software developers turned out to be better than the previous one in all respects. It can be noted that at the end of 2019, about half of the surveyed companies (51.4%) increased revenue by more than 10%. At the same time, one must admit that there were quite a few companies that reduced turnover.

In 2020, during the pandemic, the share of growing companies decreased, and that's what should happen during the crisis. But the crisis for the software industry as a whole was not as serious as it could be assumed, and therefore the reduction in the share of growing companies was small. At the same time, 47.1% of the surveyed companies increased turnover by more than 10%, 23.3% — by more than 30%, 9.2% — by more than 50% and 3.9% — by more than 100%.

In 2021, the share of growing companies turned out to be almost the same as in 2019, but at the same time the share of companies with reduced revenue became much smaller.

In 2020, it was possible to note the continued increase in the share of the Development Centers of foreign companies in the total sales of the industry. Product companies increased exports slightly more, and service companies enjoyed the advantage in growing domestic market sales. Apparently, the growth of custom development in the Russian market was facilitated by the course towards digital transformation, which requires specific changes in the business model of a particular organization, which in most cases is impossible to provide with a boxed product.

In 2021, all changes characteristic of the previous year were preserved.

2.8. Distribution of foreign sales depending on business model

Distribution of total foreign sales by companies with different business models in 2016–2021 (absolute value)

	2016	2017	2018	2019	2020	2021
Service companies	46%	47.5%	47%	40.7%	39.3%	36.75% ($3.7 billion)
Product companies	47%	46.5%	47%	49.4%	49.7%	51.65% ($5.2 billion)
Development centers of foreign companies	7%	6%	6%	9.9%	11.0%	11.6% ($1.17 billion)

Distribution of total domestic sales by companies with different business models in 2016–2021 (absolute value)

	2016	2017	2018	2019	2020	2021
Service companies	29.5%	30%	32%	33%	35%	36.3% (₽295 billion)
Product companies	70.5%	70%	68%	67%	65%	63.7% (₽520 billion)

Distribution of total turnover by companies with different business models in 2016–2021 (absolute value)

	2016	2017	2018	2019	2020	2021
Service companies	40%	41%	41.4%	36.4%	37.5%	36.7% (₽571 billion)
Product companies	55.5%	55%	55.0%	59.2%	57.3%	57.8% (₽900 billion)
Development centers of foreign companies	4.5%	4%	3.6%	4.4%	5.2%	5.5% (₽86.1 billion)

2.9. Service companies

Key performance indicators of service companies in 2021

	in rubles	in dollars	in rubles adjusted for inflation
Turn	₽571 billion	$7.8 billion	—
Turnover growth	+17.3%	+14.5%	+8.2%
Volume of foreign sales	—	$3.7 billion	—
Foreign sales growth	—	+7.9%	—
Domestic sales	₽295 billion	$4.1 billion	—
Domestic sales growth	+22.2%	+20.5%	+12.7%

2.10. Software products and off-the-shelf solutions

Key performance indicators of product companies in 2021

	in rubles	in dollars	in rubles adjusted for inflation
Turn	₽900 billion	$12.2 billion	—
Increase/decrease in turnover	+20%	+17.5%	+10.7%
Volume of foreign sales	—	$5.2 billion	—
Foreign sales growth	—	+20.5%	—
Domestic sales	₽520 billion	$7.0 billion	—
Domestic sales growth/decline	+18%	+15.4%	+8.7%

2.11. Software development centers of foreign corporations in Russia

Volume of services provided to foreign parent companies

Volume as of the end of 2020 in dollars	Change as of the end of 2020, $	Volume as of the end of 2020 ₽	Change as of the end of 2020, ₽
$0.95 billion	+16.4%	₽68.9 billion	+30%

Volume of services provided to foreign parent companies

Volume as of the end of 2021 in dollars	Change as of the end of 2021, $	Volume as of the end of 2021, ₽	Change as of the end of 2021, ₽
$1.17 billion	+22.4%	₽86.1 billion	+25%

Foreign companies that have their own development and research centers in Russia until the beginning of 2022:

Accenture, Alcatel-Lucent, Allied Testing, AVIcode, Cadence, Design Systems, Chrysler, Cisco Systems, Columbus IT, Dell, Deutsche Bank, Digia, Edisoft, EGAR Technology, EMC, EMS, Ericsson, Harman, Hewlett-Packard, Huawei, Hyundai, IBM, Intel, InterSystems, Jensen Technologies, LG Softlab, Motorola, NEC, NetCracker, Nival Interactive, Microsoft, Netwrix, Nokia, Nokia Siemens, Quest Software, RD-Software, Samsung Research Center, SAP, Scala CIS, SmartPhoneLabs, Tagrem Studio, Teleca, T-Systems.
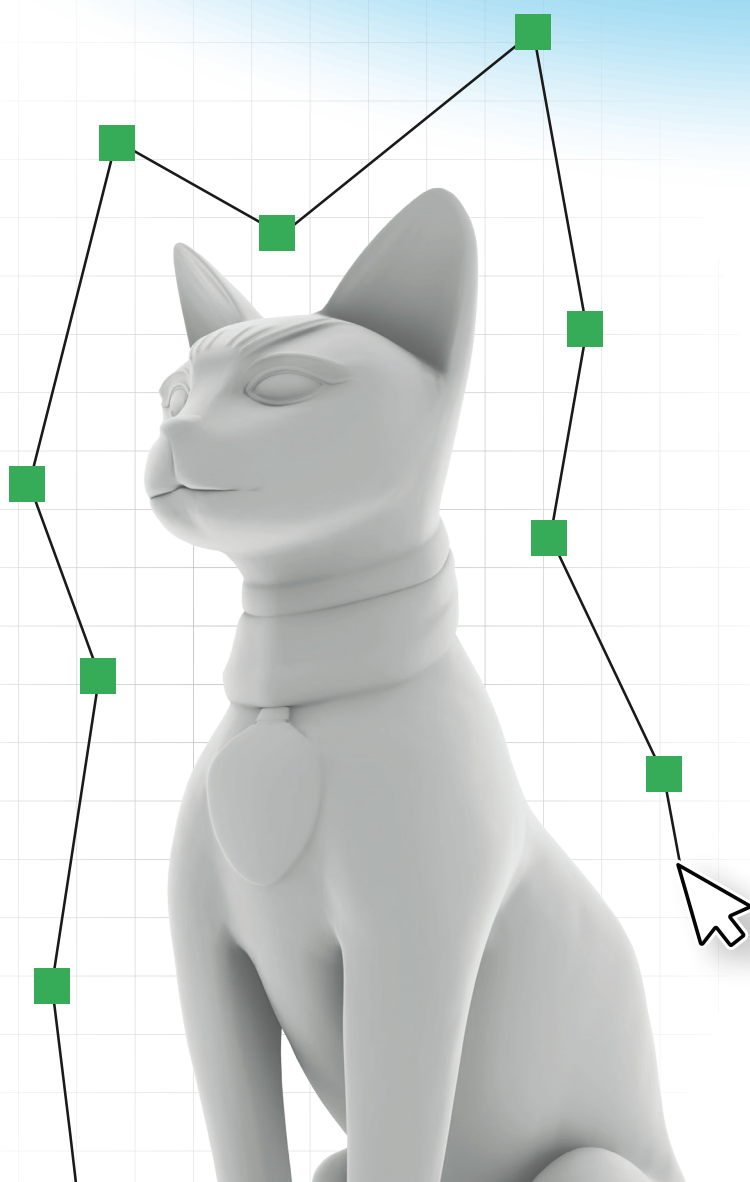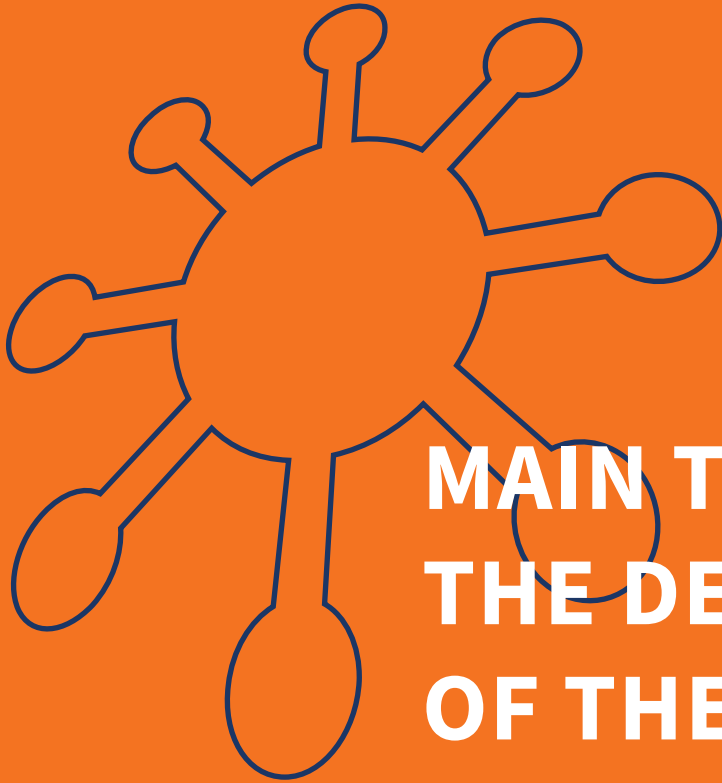
MAIN TRENDS IN THE DEVELOPMENT OF THE SOFTWARE INDUSTRY IN RUSSIA: ATTRACTING INVESTMENTS AND ENSURING TECHNOLOGICAL SOVEREIGNTY

3

MAIN TRENDS IN DEVELOPMENT OF THE RUSSIAN SOFTWARE INDUSTRY

Alexander Glazkov
CEO, Chairman to the Board of Directors, Diasoft

There are many specific features in development of software for financial services companies. As a leader of this industry, we are observing the following key trends:

— The need to substitute IT products of the foreign vendors that have left the Russian market. Financial institutions have to support their IT infrastructures under the following conditions: 1) termination of support services for previously installed IT solutions of foreign vendors; 2) shutdown of cloud services; 3) blocked supplies of foreign spare parts; 4) high risk of hacks on western systems. Some organizations have taken a wait-and-see attitude and are moving their previously installed solutions from western vendors into isolated network segments. However, the environment and products are changing, and digital transformation requires building up a continuous production process around IT products, without any downtimes. This is why Russian vendors have focused on development of completely import-independent IT solutions.

— Transformation and modernization of core banking systems. Digitalization in banking first of all means moving products and services to digital channels. Core banking systems of the previous generation were designed to support operations at bank branches and are not always fit to process requests from digital channels. With active development of remote customer service channels, the transaction load on accounting systems has increased significantly, and the capacity of core banking systems that were implemented 10 to 15 years ago has become insufficient. Besides, banks target to automate their routine operations, which excludes involvement of employees in back-office business processes. New-generation accounting systems are mostly built on the microservice architecture. This ensures high performance, scalability and reliability of IT systems, non-stop access to financial products, and the ability to independently update individual components without interrupting business operations.

— Growing interest in data processing technologies. Requirements to business manageability are constantly increasing, while we can manage only what we can measure. We need to drive value from data: not only to accumulate, but also to correctly process, structure and check validity of the data in order to make data-driven decisions and quickly respond to changing market conditions. I am speaking not about big data, but rather about digital solutions for applied use of data, namely about situation and analytical centers, modernization of operational reporting systems, etc.

— Conscious approach to creation of the IT architecture. For banks, digital transformation tasks have become much more complicated. Banks mainly focus on reducing the time-to-market of new products and correcting mistakes that were made during implementation of their IT architecture. Large banks also increase their focus on software development with the use of low-code tools, because there are no ready-made universal IT solutions that can fit all participants of the market.

3.1. Attracting investment

RUSSOFT began to pay attention to the problem of investments in the framework of its annual research in 2011. First of all, during the surveys, it was possible to determine the share of companies with external financing, as well as to clarify plans to attract investments in the next 2 years.

The fact that the lack of investment is one of the most serious problems of the industry was confirmed by the results of a survey conducted in early 2017 as part of the SAP-initiated study "Prospects for Russian IT Development in the Global Market." This study showed that for 52% of software companies, the growth of foreign sales is restrained by an insufficient marketing budget, and for 33% – by a lack of funds for the development of solutions that can be competitive in foreign markets. Moreover, software companies primarily lack "long money" – investments for 3-5 years.

The attraction of loans requires material collateral that software companies do not have due to the virtual nature of production, and therefore, usually companies need venture capital or access to the stock market. But even there, the attraction of investments is hindered by strict regulatory restrictions.

In 2017 changes in the questionnaire made it possible to estimate not only the share of companies with external financing but also the approximate volume of attracted investments. However, when extrapolating data from surveyed companies throughout the industry for four years (when summing up 2016-2019), there were too many fluctuations that in reality could hardly have taken place. Therefore, such extrapolation was not justified. This was especially true for the results of 2019, since in 2020 an insufficient number of companies (72) participated in the survey due to the pandemic, while the number

of participating companies in previous years was 150-160.

Another change was introduced in the questionnaire in 2020 – respondents were able to indicate the total number of available financial investments and their need for investments. It was possible to use this addition to calculate total investments in the entire industry only in 2021 due to the participation in the survey of a record number of software companies (206). Such activity of respondents allows making careful estimates of the volume of investments in the software industry.

Calculations showed that the volume of external financing of software companies in 2021 numbered to approximately RUB 21 billion (USD 290 million), and the total investment – RUB 96,5 billion (USD 1.34 billion) with a demand estimated at RUB 260 billion (USD 3.6 billion).

For previous years it is possible to focus only on relative values, namely: the share of external investments in total investments, the share of actual investments in the number of investments required, the expected change in the current and next years.

If the same methods of extrapolation of survey data (by total revenue) are used, it appears that in 2020 there was a significant increase in both total investment and external financing.

According to the results of 2021, the total volume of investments in the software industry numbered to RUB 232 billion (USD 3.15 billion), which is 2.4 times more than in 2020. The need for investments was satisfied by 58%. This figure also increased significantly compared to 2020, when it was 37%.

External sources of financing account for 26.4% of all investments in 2021 (22%

a year earlier). In absolute terms, these sources provided RUB 61 billion (USD 0.83 billion) in 2021, which is 2.9 times more than in 2020.

The volume of investments in the software industry increased due to the fact that the range of enterprises with investments significantly expanded – from 31% in 2020 to 51.5% in 2021 (from all software development companies surveyed by RUSSOFT). The share of companies that attracted external financing showed even bigger growth – from 7% to 21%. At the same time, each company also significantly increased the volume of its investments – from RUB 22 million to RUB 52 million (external – from RUB 4.5 million to RUB 13.6 million). The average was calculated for all companies surveyed. Some of them may not have given information about the investment, not because there were no investments, but because they did not want to report them.

The sharp increase in investments revealed as a result of the annual survey of software companies conducted by the RUSSOFT Association is confirmed by the research performed by the Moscow Innovation Agency, according to which in 2021 venture investments in Moscow set a historic maximum, increasing their volumes by more than three times compared to 2020: USD 1794 million against USD 536 million. As in previous years, the capital of Russia became the absolute leader in terms of venture capital investments in the country, occupying more than 70% of the market. In 2021, the growth of the Moscow market numbered to 235%, while the Russian market increased by 160%.

However, it turned out that about one in three transactions with a Moscow-based startup (registered in the capital) were made in foreign jurisdictions. At the same time, the share of such transactions in

the total number increased gradually: from 28% in 2019 to 33% in 2021. The attractiveness of Russian jurisdiction for venture market participants remained not very high due to its opacity and excessive regulation.

In this context, foreign financial markets were more attractive to entrepreneurs. In addition, the registration of a legal entity and the relocation of the company were often a requirement of a foreign investor. If a startup aimed at the development of a global business, this requirement had to be met. As a result, Russia recorded mostly early-stage transactions in 2021, and most major Round B and C + transactions were made in foreign jurisdictions, and their share grew steadily.

In the Moscow venture market, foreign investment for the first time in history exceeded the number of capital invested by Russian investors. The inflow of foreign investments became the driver of growth in the venture market as a whole. In 2021, the volume of foreign investments in Moscow startups grew more than nine times.

In 2021, private funds became the main drivers of market growth, unlike in 2020, when corporations played this role. The volume of investments of private funds in 2021 increased more than six times, and these investments accounted for more than 70% of total investments. Private funds increased capital, which allowed them to make transactions in excess of USD 10 million, the participation of Russian funds in joint transactions with foreign investors increased, and new "serial" funds appeared created by management companies operating portfolios of several funds.

Corporations also continued to build and develop their ecosystems (acquiring companies and embedding them in their business model) and actively invest in startups, although their share in total investments decreased compared to 2020 against the background of a sharp increase in investments of venture capital funds.

Investments in business software (B2B) increased significantly. First of all, investors invested in data mining developments that allow them to make balanced and grounded management decisions. Investments in low-code or no-code platforms made by investors also showed growth, thanks to which it became possible to create proprietary software products even not having programming skills.

The analysis of public reports also indicates a significant increase in investments in 2021 and, in particular, in external financing (a twofold and a threefold increase, respectively). More information on this topic is presented in the following section.

It is very difficult (almost impossible) to accurately calculate absolute values when accessing the volume of investments in the high-tech field or the size of the venture market. The variation of estimates depending on the method used is traditionally very wide. At the same time, if various sources indicate the growth by a several-fold factor, and if there were no obvious signs of a sharp increase in investment activity in previous years, then it is quite possible to talk about the investment boom in the software industry identified in 2021. Herewith, this boom started in 2020 (probably in the second half of the year). RUSSOFT determined the increased activity of investors according to the results of the survey conducted in 2021. However, analysts of the Association were in no hurry to draw unequivocal conclusions about the start of the investment boom, offering to wait for the results of 2021. As a result, our assumption was confirmed that the problem of investment deficit was solved.

3.1.1. Top events related to investments in the hi-tech sector

In addition to the results of the annual RUSSOFT survey of software companies, the level of investment activity in the industry allows performing the analysis of publications related to investments in the high-tech sector of the Russian economy. This analysis is performed both for events characterizing the situation as a whole, and for reports on the fundraising activities of specific enterprises.

The number of reports on significant events related to investments in the high-tech sector of the Russian economy increased sharply in 2019. This growth continued in 2020-2021. No growth may be traced at the end of 2022 due to the high uncertainty in the entire Russian economy that arose as a result of the start of a special military operation in Ukraine. However, some pause in the number of publications occurred only during the three spring months.

Since the beginning of 2021, most reports were related to the allocation of funds from the state budget (in the form of subsidies, grants, direct funding). Of the total number of such reports (15), 8 were published in 2021 and 7 during incomplete 2022. 11 news were found on the creation or expansion of venture funds (all in 2021). Fundraising by way of IPOs or by additional issues of shares (or bonds) with placement on Russian stock exchange houses was reflected in 6 news reports (3 in 2021 and 2022).

In previous years, some news offered hope for investment funds attraction from abroad. Such news appeared before the start of a special military operation in Ukraine, but, apparently, the announced plans for international cooperation in the next 2 years will not be implemented. It is still possible to rely on foreign financing from companies and investment funds of "friendly" countries (primarily Chinese),

The number of reports on significant events related to investments in the high-tech sector of the Russian economy in 2017-2022

| 8 | 6 | 13 | 17 | 25 | 12 |
| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 (first 7 months) |
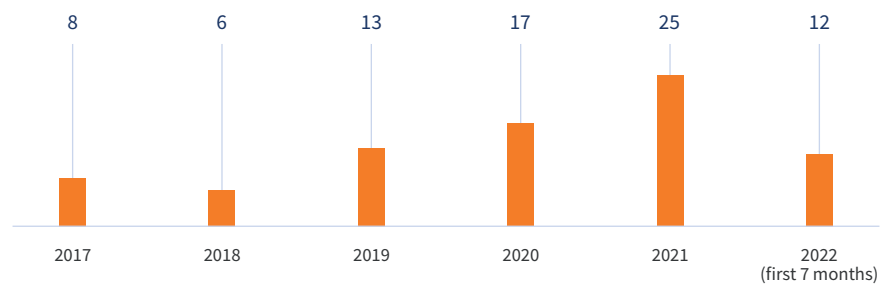
but this financing is unlikely to be large-scale. Consequently, in the foreseeable future software companies and other enterprises in the high-tech sector of the country's economy will have to rely only on domestic sources of investment. However, it can be assumed that it will be not the availability of financial means for investments in the hi-tech sector acting as the main limiting factor, but the availability of human resources.

"Friendly" countries can help admit Russian software companies to their markets, which will allow these companies to have more of their own funds that can be used to develop solutions and business as a whole.

The number of news reports on investments attracted by specific high-tech enterprises in Russia in 2017-2022

| 9 | 9 | 21 | 24 | 61 | 11 |
| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 (first 7 months) |
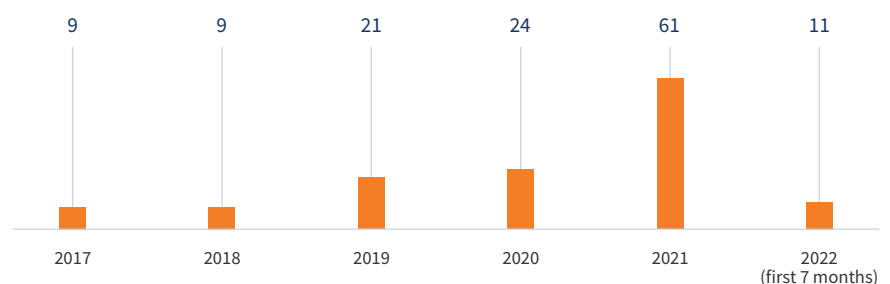
The number of news on investments attracted by specific companies allows judging the significant increase in investment activity in 2019 and the real investment boom in 2021. To add up the volumes of investments exceeding USD 1 million indicated in various publications, then by the end of 2021 those will be USD 736 million (RUB 54.2 billion). This is about three times more than a year earlier (USD 251 million or RUB 18,1 billion).

The total volume of investments with an investment number of less than USD 1 million per company can be estimated based on the results of the survey. If you extrapolate the obtained data on the companies surveyed throughout the industry, you come to the total growth of volume of such investments from RUB 38 billion in 2020 to RUB 73 billion in 2021 (almost 2 times). If you allocate only external financing, then the growth will be even more significant – from RUB 10.7 billion to RUB 34.7 billion (more than 3 times).

Starting from the beginning of 2021 commercial investment funds and private investors (companies and individuals) were most often mentioned as a source of investment. 53 corresponding news reports appeared during the period of one year and 7 months (44 in 2021 and 9 in 2022). State structures acted as a source of financing 7 times (6 in 2021 and 1 in 2022). Three reports on the placement of shares or bonds on the stock exchange in Russia were recorded (all of them relate to 2021, and the same number was recorded in 2020). Foreign investors were mentioned 10 times in 2021 and 2 times in early 2022.

The inter-industry capital flow became noticeable (investments in the IT sphere made by investors representing other industries). Such flow-over is reflected in 4 news reports in 2021 (not more than

one report was registered in previous years).

Judging by the part of available news reports, you can identify the areas that are of interest to investors. In terms of the number of mentions during 2 incomplete years, the first place was occupied by Internet projects and cloud services (11 news reports). The following areas were mentioned 4 times: "Improvement of office and basic software," "Computer games," "Artificial intelligence" and "Robotization," 3 times – recognition systems (text, images, voice), one each – "Videoconferencing," "Backup," "Virtualization," "Medtech," "Solutions for the tourism industry," "Solutions for agriculture," "Internet Solutions for the oil and gas industry", "Internet of Things", "Blockchain", "Unmanned Aerial Vehicles", "Enterprise Resource Planning", "Information Security".

It can be assumed that Information Security forms one of the most interesting areas for investors. However, enterprises representing this area of activity are very reluctant to disclose data on both their revenues and attracted investments.

In 2020, investors were most attracted by the automation of various types of activities (tourism, production, management, payments, etc.). Robotization and artificial intelligence were in the second place, and recognition systems (objects, faces, emotions, texts, etc.) occupied the third place. Office software and information security systems occupied the third and fourth places, respectively.

In the upcoming years big data technology will be actively developing within the fintech industry. These solutions will be foundation for advanced analytics in order to create deeply personalized offers. One of the projects co-developed by Innotech is a geo-platform which resorts AI to study the data from over 180 geo-layers. By bringing together anonymized information, the system identifies patterns to match the customers' and businesses' needs. Another trend deals with alternative payment mechanisms for international transactions. For example, amid the sanctions, the digital ruble can become an efficient transnational payment method.

Dmitry Kharitonov
CEO of Innotech Group

●● ⬭ INNOTECH

3.1.2. Availability of investments in companies with different business models

Shares of surveyed companies with available investments in 2021 by categories

	Any investments	Attracting external funding
All companies surveyed	51.5%	21.1%
Size of companies		
Less than RUB 375 million turnover	49.6%	16.6%
More than RUB 375 million turnover	57.5%	32.5%
Business Model		
Products	50.5%	20.8%
Services	52.9%	22.1%
Share of exports		
No export	54.2%	20.8%
Less than 50%	50.3%	19.7%
More than 50%	58.3%	29.2%
Head Office Location		
Moscow	62.8%	25.5%
St. Petersburg	41.0%	20.5%
Other cities	49.4%	18.5%

The forced redrawing of the market, necessity to reduce the dependence from foreign software, rapid rebuild of the customers IT infrastructure, turbulence in the labor market: these are just fraction of the challenges that software developers had to face in 2022. Despite the difficulties, one of the main acquisitions of this time is the settlement of a new quality of relations between customers and software producers, which can become the basis for the development of the industry in long term.

Elena Bocherova
Executive Director
of Cyberprotect

CYBER PROTECT

At any breakdown of companies into categories, at least 41% of respondents reported on the existing investments and at least 16% – on the attraction of an external source of financing. The spread depending on the type of companies appeared to be not very wide. The companies with an export share in turnover of more than 50%, with a turnover of more than RUB 375 million, as well as enterprises with Moscow-based headquarters can be distinguished in terms of the availability of investments (including external financing). The size of the company has a particularly strong effect on external investments attraction.

3.1.3. Plans of software companies to attract investments and these plans implementation

The data of the annual survey allow RUSSOFT to determine not only the approximate volume of investments, but also the share of companies that would like to have external financing, but cannot attract it.

During the period from 2011 to 2018 there were at least 2 times (almost 2 times in one year) more companies that counted on external financing than those that received investments. For example, in conditions when 14% of surveyed companies expected to receive external financing by the end of 2017, in reality the share of investments received was only 6%. Accordingly, the assumption that the need for external financing is many times higher than the number of actual investments has received additional confirmation. Other sources confirmed an equally large gap, but, as a rule, they represented the entire high-tech sector of the Russian economy, or at least the entire IT industry (along with Internet companies).

By 2018, the results of surveys showed that companies began to more realistically assess the prospects of investments attraction. Available opportunities are still significantly overestimated by companies in terms of the volume of expected investments, but no big difference is observed any longer with relation to the forecasts on raising funds from external sources. For example, 11% of companies surveyed in 2017 and 12% of companies surveyed in early 2018 were counting on investments in 2018. The share of actual recipients is fully consistent with the forecast – 11%.

In 2020, the difference was again quite large: 12% of companies planned to attract external investments this year, but in fact only 7% of companies have actually attracted investments. However, there are some signs of recovery. Firstly, the total volume of investments

Share of companies that have attracted or plan to attract external financing

Year of survey	in the previous year	in the current year	next year
2011	9%	16%	18%
2012	9%	24%	26%
2013	12%	25%	25%
2014	7%	18%	27%
2015	7%	22%	24%
2016	10%	19%	23%
2017	11%	14%	11%
2018	6%	12%	10%
2019	11%	13%	16%
2020	6%	12%	27%
2021	7%	16%	18%
2022	21%	34%	—*

* – due to the high uncertainty in spring 2022, as a result of the start of a special military operation in Ukraine, it was decided not to ask the company about their plans for the next year

(jointly with own funds of companies and the funds of their founders) has grown significantly. Since the survey performed in spring 2020, which was supposed to allow to summarize the results of 2019, did not turn out to be full due to the outbreak of a pandemic with a very high level of uncertainty, no direct comparison of year 2019 data with year 2020 data was conducted during the questionnaire survey. Nevertheless, an assumption was made about a significant increase in investments, which assumption must be checked by the end of 2021.

Secondly, new sources of financing appeared – the placement of shares and bonds on Russian stock exchange houses, as well as the provision of grants and subsidies by state development institutions. These sources existed before, but it was in 2020 that they started to work in such a way that they started to cover a fairly wide range of companies.

In 2020 respondents received the opportunity to indicate their total investment volume and their need for investments. Although due to the

pandemic it was not possible to conduct a full-fledged survey, some preliminary conclusions on the new data obtained can be drawn.

A survey with an updated question about investments showed that at the end of 2019, external financing accounted for only about one fifth (18%) of the total volume of investments. Own funds of companies and their owners form the main source of investments in the software industry. At the same time, software developers believe that the volume of effective investments could be 60% more.

Share of companies that invested in their development in 2020, with a separate indication of external investments (forecast for 2021-2022)

	In 2020 (fact)		In 2021 (forecast)		In 2022 (forecast)	
	Investments from all sources	Attracted external investment	Investments from all sources	Attracted external investment	Investments from all sources	Attracted external investment
Less than RUB 64 million	25%	7%	27%	12%	25%	13%
From RUB 64 million to RUB 320 million	6%	0%	8%	3%	10%	4%
From RUB 320 million to RUB 640 million	1%	1%	1%	1%	2%	2%
More than RUB 640 million	0%	0%	0%	0%	0%	0%
Found it difficult to answer	5%	5%	5%	4%	6%	5%
Attracted (plan)	31%	7%	36%	16%	36%	18%

Share of companies that invested in development in 2021, with a separate indication of external investments (forecast for 2022)

	In 2021 (fact)		In 2022 (forecast)	
	Investments from all sources	Attracted external investment	Waiting for investments from all sources	Expecting to attract external investments
Less than RUB 75 million	40%	19%	32%	25%
From RUB 75 million to RUB 375 million	8.8%	2%	16%	6%
From RUB 375 million to RUB 750 million	2%	0%	2%	2%
More than RUB 750 million	1%	0%	2%	1%
Found it difficult to answer	9%	11%	12%	13%
Have (plan) investments	52%	21%	52%	34%

The results of 2021 in terms of the comparison of the forecast with actual results obtained were unexpected. Only 16% of respondents expected external funding in the "current year" (2021), but in fact external funding was received by 21% of respondents. 36% of surveyed companies planned to receive investments from all sources, including their own funds, and 52% of respondents received investments in 2021. Consequently, there was a situation where investments became available to many companies that did not even plan them. This can be partly associated with the pandemic, which accelerated the introduction of information technologies (especially in the field of remote learning, work, entertainment), partly with the imports phaseout accelerated due to the sanctions policy (in any case, the need to replace foreign solutions with domestic counterparts has increased sharply).

52.1% of surveyed companies plan to invest in the development in 2022. These data were obtained based on the results of the survey conducted this spring. It was decided not to ask the respondents about their plans for the next year (2023) in connection with the

high level of uncertainty that arose in spring 2022 regarding the future of the industry and the situation in the Russian and world economies. Consequently, in 2022 approximately the same number of software companies (the same share) indicated the presence of investment plans as the number of companies having actually attracted investments in 2021.

However, it should be noted that by the end of 2022, 34% of surveyed companies counted on external financing, and 22% of respondents actually received financing in 2021. If we assume that all forecasts are being implemented, then the total investment in 2022 shall grow by 60%, and external financing shall grow by 214%. At the same time, the need for investments (the number of effective investments that companies can theoretically master) still turns out to be 2 times higher than the projected volume of investments (from all sources).

It is difficult to judge how correct the forecasts for 2022 will be until the completion of the next survey of companies in 2023. On the one hand, the need for investments did not decrease, but have increased with a high degree of

probability: many urgent tasks occurred related to imports phaseout, and the need emerged to reorient to new markets due to the closure of Western markets for Russian companies. On the other hand, several months were lost due to the fact that the development strategy had to be urgently adjusted in the event of a radically changed situation in the Russian and foreign markets. In addition, some foreign funds could curtail their activities in Russia.

Public reports on investment activity in the high-tech sector of the Russian economy indicate no signs of growth in the first 7 months of 2022. These reports indicated not the growth, but the decrease in the field of investment by the end of the year. Herewith, the conditions for sharing information about plans and attracted investments were not the best in the first half of 2022. For example, foreign investors could completely mask their activities in Russia so that these activities are not noticeable to anyone.

Nevertheless, it is still possible to focus on the expectations of companies, since the survey was conducted within the first months after the start of a special military

Share of total investments (actual in 2020 and projected in the next 2 years) in the volume of required investments (calculated based on the data of the survey performed by RUSSOFT in 2021)

2020 (fact)	37%
2021 (forecast)	37%
2022 (forecast)	35%

Share of external financing in total investments in 2020 and the next 2 years (calculated based on the data of the survey performed by RUSSOFT in 2021)

2020 (fact)	21%
2021 (forecast)	44%
2022 (forecast)	54%
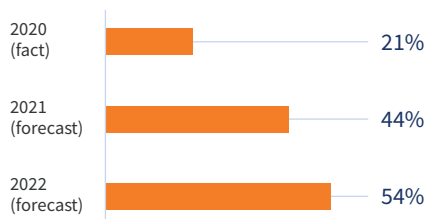
Share of external financing in total investments in 2021 and 2022 (calculated based on the data of the survey performed by RUSSOFT in 2022)

2021 (fact)	26%
2022 (forecast)	52%
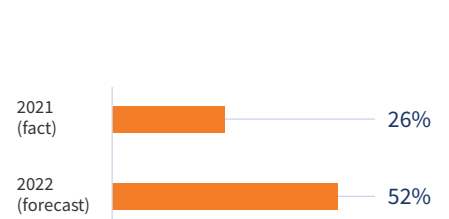
operation in Ukraine, which means that respondents should already have taken into account the high level of uncertainty of the situation in their forecasts.

Investments available in 2020 covered only 37% of the companies' demands for financial investments. Based on the estimates of surveyed software companies, it can be argued that they could master more than 2.5 times more investment funds than they could attract. In 2021 this indicator was as high as 58%, and, according to a forecast based on the expectations of respondents, by the end of 2022 it will be 50%.

It is not a fact that in reality, with unlimited sources of investments, companies can master 2-2.5 times more investments than they expect to receive,

primarily due to a shortage of personnel (they will be able to expand the staff accordingly only at the account of each other).

A request for a radical change in the financing structure in the industry still exists, although the share of external sources in 2021 has increased. It is difficult to judge how reasonable the expectations are in the current situation of high uncertainty. Most likely, even in the most optimistic scenario, such a powerful increase in external funding is unlikely. Nevertheless, a gradual increase in its share is quite possible considering the high level attention that the government began to pay to the industry. And there is already an increase in external investments.

Historically, the most popular direction of Russian video conferencing software development is the creation of simplified web conferencing products based on Open Source. Less popular and time-consuming approach is the development of classical videoconferencing solutions on the basis of ITU-T international standards. For example, Vinteo company created flagship software in the second segment in 2010, providing a technological "groundwork" for the future. Based on the professional VCS product, it makes it possible to build an extended ecosystem of solutions and adapt them to the tasks of any category of customers - B2B, B2G and B2C.

Boris Popov
Director of Business Development at Vinteo

3.2. Ensuring technological sovereignty and imports phaseout

The process of imports phaseout in the field of software has been going on in Russia since about 2000, when the first solutions that have certain advantages over foreign counterparts began to appear on the Russian market. For a decade and a half, the main drivers of this process were as follows: 1) the emergence of new domestic software products; 2) improvement of existing Russian solutions; 3) the high cost of products offered by Western companies. At the same time, as a result of the devaluation of the ruble (2008-2009 and 2015), there was a sharp increase in the cost of foreign solutions in Russian currency for Russian buyers.

The fight against piracy also played a role, since the state forced enterprises (primarily small ones) to pay for those software products that they earlier were using for free. At the same time, users often installed pirated copies with redundant functionality. In some cases, such increases in costs have prompted the search for a cheaper domestic alternative. However, the transition to Russian solutions as a result of the fight against piracy did not become a mass phenomenon. More often, to legalize their pirated software, companies agreed to pay foreign vendors, sometimes switching to cheaper versions of products from the same vendors.

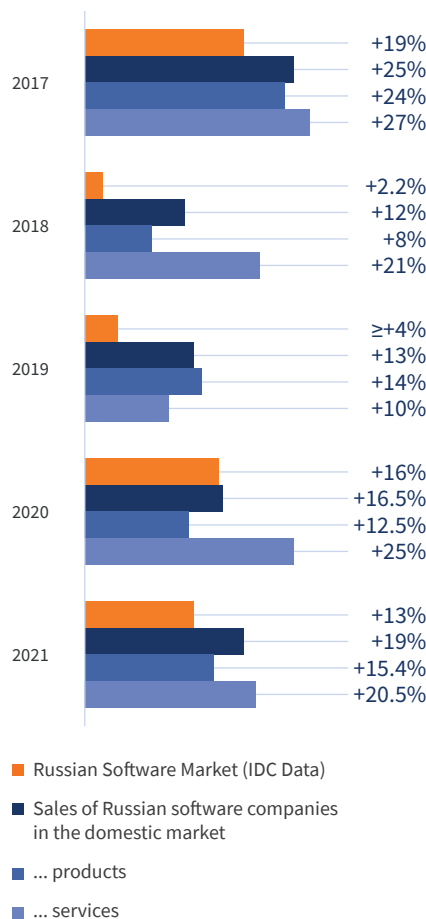Until 2014 the imports phaseout policy if was announced by the State, but actually was not pursued. It can be assumed that the exception was only especially secret areas, but there is no information in the public domain about what software was used in them. Most likely, the imports phaseout policy had nothing to do with such areas, since initially only tested domestic solutions were used at secret facilities, the main feature of such solutions being not the functionality, but such characteristics as reliability and security.

Сравнение показателей роста российского рынка ПО и продаж российских софтверных компаний на этом рынке (в долларовом измерении)

2017
+19%
+25%
+24%
+27%

2018
+2.2%
+12%
+8%
+21%

2019
≥+4%
+13%
+14%
+10%

2020
+16%
+16.5%
+12.5%
+25%

2021
+13%
+19%
+15.4%
+20.5%

■ Russian Software Market (IDC Data)

■ Sales of Russian software companies in the domestic market

■ ... products

■ ... services

Another driver appeared after 2014 in the process of imports phaseout - the sanctions policy of Western countries, affecting individual enterprises, entire industries and even higher educational institutions. Enterprises, government agencies and educational institutions, to which Western vendors refused to supply their solutions and to provide their

technical support, were forced to actively engage in the purchase and installation of domestic solutions replacing foreign ones (in extreme cases, freely distributed software, the presence of bookmarks in which cannot be excluded).

The government of the Russian Federation had to intensify its activities in order to respond both to the sanctions already imposed and to those that may appear in the future. In June 2015, the President of the Russian Federation signed the law "On Information, Information Technologies and Information Protection," which provided for the creation of the Register of Domestic Software. Special services began to demonstrate special interest in the software used at certain strategically important enterprises. Nevertheless, in general, sanctions themselves were a more powerful driver of the imports phaseout process than a well-thought-out state policy (more information on this policy is presented in section 3.2.2).

As a result of sanctions imposed against specific organizations and enterprises, state corporations have developed and launched imports phaseout programs. The process as a whole in the country accelerated, but still continued to falter in many areas. However, it is still possible to judge the acceleration or slowdown of imports phaseout only by a number of indirect signs. There is no objective data on how to replace the solutions of foreign companies with domestic ones.

RUSSOFT monitors the imports phaseout process in the following ways: 1) compares changes in the volume of sales of Russian software companies in the domestic market against the changes in the scale of the software market; 2) analyzes public communications directly related to the imports phaseout process; 3) monitors data on sales of companies whose solutions are massively purchased as an

alternative to foreign software products; 4) studies the intensity of applications development for different operating systems and DBMSs.

Judging by the ratio of software sales in the domestic market and by the scale of this market, the imports phaseout process showed no stability in recent years – now it accelerated and now it slowed down. Yet another slowdown of the process was recorded in the end of 2017, and in 2018 it accelerated again.

If we compare the growth rates of the market and the growth of sales of Russian companies in the domestic market, then in 2016 the difference seems huge – 30 percentage points (sales of domestic companies in this year grew so much faster than the market), in 2017 this difference decreased to 5 percentage points, and in 2018 increased to about 10. In 2019 it remained on the same level. It can be assumed that these fluctuations were associated with fluctuations in the national currency against the US dollar.

According to the results of 2020, there was no significant difference between the growth indicator of the software market and sales of Russian software companies within Russia. The revenue of product companies from operations in the domestic market grew even slightly less than the market (data for comparison are taken from IDC, the only analytical company that discloses the results of its own research of the Russian IT market).

In 2021 sales of Russian software companies began to grow again faster than the market, but with account for the not very significant difference in growth rates and the fact that the IDC study does not cover the entire Russian software market (which means that with a more complete coverage, the market expansion indicator could be somewhat different), it is not worth talking about the presence

of a clear sign of acceleration of the imports phaseout process. Apparently, it is the sales of Russian software that determine the dynamics of the expansion of the domestic software market. In addition, this comparison to some extent reflects the substitution in sales, and not the replacement of the software used. We can only assume that with high sales growth rates of Russian software companies, the transition of users from foreign to domestic software is quite active. However, even approximate quantitative estimates of how actively this substitution occurs cannot be made using this method.

Service companies, which are dominated by revenue from custom developments, in recent years have increased sales in the domestic market faster compared with this market growth.

Custom software companies have not previously been classified as participants in the imports phaseout process, since starting from 2005-2008 their foreign competitors almost did not provide similar services in Russia. In fact, imports phaseout in the field of software development services provision in Russia was successfully performed by Russian service companies, which did not allow either competitors from India and China (other developing countries with lower efficiency and close price of providing services) or competitors from developed countries to gain a foothold on the Russian market.

At the same time, custom development often serves as an alternative to buying and installing a foreign system. Quite often ready-made solutions offered on the market do not satisfy customers in terms of functionality, and therefore these customers employ service companies to create a unique solution for their needs. Moreover, due to the powerful process of digital

transformation, it is becoming more and more difficult to provide all the functionality for different companies within standard replicated solutions. Thus, there are two main motives for custom development instead of buying a ready-made system: the need for unique functionality and the drive to gain independence from foreign suppliers.

The analysis of public communications directly related to the imports phaseout process indicates a significant increase in the attention paid to this process by the government, developers, state bodies and corporations that occurred in 2021. In 2022 after the start of a special military operation in Ukraine, this activity increased even more: the number of reports on the transfer of clients to Russian software, as well as on the decisions of the government (and other state bodies) in the field of imports phaseout has doubled. Analysts, system integrators, consultants and distributors became much more interested in the issues related to imports phaseout. More information on the results of this analysis is presented in the following section (3.2.1.).

Information about the revenues of IT companies operating mainly in the Russian market, replacing foreign counterparts with their solutions, and about the sales in Russia of vendors from "unfriendly" countries also indicates that the pace of imports phaseout has increased significantly. As a rule, revenues of domestic software developers, computer and telecommunications equipment manufacturers are growing much faster compared to the growth of the Russian segment of the IT market in which their solutions were present. At the same time, the revenues of Western vendors either decreased or grew only slightly. For example, the media reported that the number of staff in the Russian

representative office of Microsoft over the past 4 years has decreased almost by 50%, and the revenues of Russian legal entities of Cisco, according to the "Contur.Focus" service, decreased in 2021 by 3.7% (from RUB 37.1 billion to RUB 35.8 billion). In the second half of 2022, sales of many vendors in Russia may well reduce to zero, as these vendors have announced their exit from the Russian market.

Another way to determine the progress of the imports phaseout process is to estimate the growth of free software (FSW) consumption. This method shows that in the field of system software the share of the Linux operating system family, as well as the PostgreSQL DBMS, has sharply increased in recent years. In most cases, domestic versions of these open source systems are installed in the corporate sector.

According to RUSSOFT, the share of MS Windows in terms of time spent for the development of solutions and applications for MS Windows has decreased from 42.5% in 2019 to 28.2% in 2021, and the corresponding indicator for the Linux family has grown over the same years from 30.0% to 48.8%. These data are obtained from surveyed companies, and the dynamics is similar when extrapolating these data to the entire industry. The share of PostgreSQL over the past two years has increased from 35.8% to 47.1%, and for all other DBMSs (except Oracle) this indicator showed reduction. For example, in MS SQL, it decreased from 32.4% to 17.2%.

The results of various studies and surveys present some additional points to ponder. However, this information can be used specifically for contemplation, and not to obtain an adequate idea of the situation, since each data source needs to be dealt with – how the data is obtained, how correctly these data reflect the

imports phaseout process as a whole or, at least, how this process is progressing in certain sectors of the economy.

According to a survey of participants of the conference for IT managers "CIO Prom Day – Imports Phaseout in Industry," organized by the NWComm agency in May 2022, the exit from the market or suspension of activities of foreign software suppliers has a critical effect for 8.5% of enterprises and organizations, has a strong effect on 28% of respondents, has a medium or moderate effect on 50% of respondents; and 11% of respondents almost did not feel the changes, and 2.4% of respondents do not use foreign software.

Regarding the exit of foreign equipment suppliers from the market, the following results were obtained: critical effect – 12.2%, strong effect – 43.9%, medium or moderate effect – 36.6%; barely felt the change – 6.1%, and do not use foreign equipment – 1.2%.

The survey showed that the IT strategy and plans of 9% of Russian industrial companies have completely changed due to the exit of foreign suppliers from the market, 66% have partial changes, 15.4% almost do not change the strategy and plans, 1.3% did not change. 7.7% of respondents found it difficult to give an answer to the question.

Respondents also answered a question about priority plans to replace foreign software and hardware during 2022-2023. 10.4% of respondents intend to replace ERP/BI/CRM, 2.6% intend to replace ECM/BPM, storage systems – 16.9%, information security systems – 12.3%, cloud technologies – 3.9%, virtualization – 13.6%, network equipment – 20.1%, IP telephony and contact center management – 6.5%. 13.6% of respondents did not plan to replace anything.

During a survey of YooKassa (the service of the fintech company YooMoney) and the country's media holding Rambler & Co, it turned out that about 50% of Russians are satisfied with the quality of Russian software, and 60% of users have been using it for several years. From January 1 to May 31, 2022, Russian employers bought different software for their employees 39 times more frequently compared to the same period last year. Most of respondents from among the employees of enterprises (29%) use domestic browsers and antiviruses on their work computer. 18% of respondents choose Russian office and mail software suites, and 16% choose Russian accounting software suites. Domestic operating systems (9%), cloud services and CRM systems (4%), video conferencing systems (4%) are also popular among employees.

Users also tend to use Russian browsers and antiviruses (24%) on home computers. Among 12% of respondents, domestic office and mail software suites are also popular among 12% of respondents, and one of every ten respondents chooses domestic operating systems. Photo and video editors, PDF programs and cloud services account for 3%, 3% and 2%, respectively.

The turnover of B2B payments of online stores selling software through YuKassa increased 8.7 times. Most of companies have purchased software in the number of one to five thousand rubles - the share of such purchases was 60%.

In July 2022 Vasily Shpak, the Deputy Minister of Industry and Trade, has announced the positive impact of Microsoft's departure on Russian software manufacturers and has presented the following data:

- a third of Russian companies (33%) have already begun or plan to transfer

their business processes to domestic IT solutions in the near future;

- a quarter of Russian business (25%) uses only domestic IT products.

At the same time, for most companies (69%), the issues of imports phaseout related to software continue to be relevant, since they either combine work with Russian and foreign software (61%), or use only imported IT products (8%).

According to IDC, domestic software purchased in Russia in 2020 accounts for 47% of all software purchased in the country. Almost half of the OCS software portfolio is represented by Russian vendors.

It is not easy to obtain such quantitative indicators which would absolutely objectively characterize the entire process of imports phaseout, if not to say that it is impossible. For example, if you

switch to free software that allows not depend depend on the loyalty of foreign countries, the issue may not always be related to software sales, but rather to the provision of services for this software installation, support and development. Small enterprises download such software from open source repositories without even requesting a service for its support and installation.

3.2.1. Analysis of news reports directly related to imports phaseout

Analysis of news reports related directly to software imports phaseout allows to come to the following conclusions. First of all, it is worth noting the intensification of the transition of Russian corporations and authorities to domestic software after a slight slowdown in 2020 caused by the uncertainty of the situation in the first months after the declaration of the pandemic. In 2021, the acceleration of the process observed before the pandemic continued and became apparent (there was, apparently, a catch-up in the implementation of plans already charted for 2020-2021). In 2022, the process of transition to domestic software became even more active. If judged by the number of news reports on such a transition in the first 7 months, then there were about 2 times more such news reports.

It should also be noted that the number of reports on the adopted or planned decisions of the government (the largest companies) stimulating imports phaseout (ensuring technological sovereignty) increased in 2021. At the same time, some news reports reflected the activity of key private companies and other

non-governmental structures (primarily industry associations) proposing to adjust the state policy in this area. In 2022 the number of relevant reports was even higher due to the start of a special military operation in Ukraine and to the emergence of new threats from sanctions and to the exit of companies subordinate to the policies of "unfriendly" countries from the Russian market.

The improvement of Russian IT solutions (or even the creation of platform solutions) started to be more frequently mentioned since September 2020. In the last 4 months of that year, there were 3 such news reports, with only one in the previous 8 months (3 news reports in the first 8 months of 2021). In this case, it is not the number of these news reports that is more important, but their dynamics. Subsequently, it turned out that at the end of 2020 the activation of developers has just only started: in 2021 and 2022, the number of relevant news reports began to grow about 3 times annually.

There were very few statistics characterizing the imports phaseout

process. There have been problems with this before, especially in terms of their reliability. Most likely, such data did not get into the media due to their absence. In 2021, there were many times more news reports than a year earlier. By the end of 2022, this growth will continue, and the number of publications is likely to grow more than 2 times (possibly 3-4 times). Even analytical companies (for example, IDC) started to provide the media with such data, because the issue of "imports phaseout" is becoming the most significant for the Russian IT market.

At the same time, in general, the entire process of imports phaseout (and even more – the process of ensuring technological sovereignty) cannot be assessed unequivocally and quite accurately for all the quantitative indicators presented. It is clear that this process has accelerated in previous years, and after the start of a special military operation, the pace of transition to domestic software increased even more (in certain categories of software – 2-3 times compared to the same period last year).

Naturally, in the first half of 2022 there were by an order of magnitude more reports on restrictions on the sale of imported software by foreign vendors. At the same time, the importance of these news reports increased sharply: if earlier it was a question of sanctions against certain Russian structures or entire industries (defense complex, oil and gas industry), then in March 2022 the refusal of all supplies and all support of all Russian users was launched in the context of the complete exit of foreign companies (primarily American and European) from the Russian market. Some vendors still tried to prepare Russian customers for their exit from the Russian market, while others refused already paid deliveries and were not going to return payments already made.

Distribution of media news reports directly related to imports phaseout in 2018-2022 by topics

	2018	2019	2020	2021 (January-August + September-December)	2022 (January-July)	For 2018-2022 in the number of
Transition of Russian corporations and authorities to domestic software	6	12	10	53 (26+27)	50	131
Decisions of the government (key companies) stimulating imports phaseout	11	11	13	35 (17+18)	29	99
Sales of companies that most benefit (or loss) from imports phaseout	—	5	3	6 (5+1)	6	20
Statistical data characterizing the imports phaseout process	—	7	2	12 (2+10)	20	41
Revision of imports phaseout plans in favor of foreign software (other problems)	—	2	5	3 (0+3)	8	18
Improvement of Russian solutions (development of a set of solutions)	1	2	4	11 (3+8)	31	49
Reports on sanctions aimed at the restriction of foreign software purchases for Russian enterprises	2	—	1	3 (2+1)	17	23
Involvement of system integrators, distributors, various consultants in the imports phaseout process.	—	—	—	3	16	19
Total in a year	20	39	38	122	176	

3.2.2. State policy aimed at the assurance of technological sovereignty

After much talk about the need for imports phaseout, after the adoption of the first anti-Russian sanctions applicable to the supply of software to Russia, adoption of relevant decisions at the state level was started in 2014, however, resulting in no significant effect for almost two years. It turned out that first it was required to decide on what exactly needs to be stimulated, and what shall be identified as "imports phaseout". It was required to make a definition of the domestic developer O (it took almost a year to formulate this definition and to introduce appropriate amendments to the legislation).

When clarity with the definitions appeared and a ban was formulated for state structures and enterprises to purchase foreign software in the

availability of a domestic analogue, it was found that no control mechanism was developed. In addition, it turned out that purchasers in state structures do not have incentives for imports phaseout, but they seriously risk criminal prosecution for violation of the legislation regulating the conditions of procurement, while compliance with these conditions is impossible in case of imports phaseout before the end of the depreciation period for already purchased imported software.

As a result, despite the bans, state structures continued to purchase foreign solutions (either justifying this fact by the absence of a domestic analogue, or purchasing software under the trademarks of Russian companies that use the OEM model for this).

While the state was working out the approaches to software imports phaseout and tried to form tools for its financial support, Russian IT companies started in 2014 to actively take actions aimed at the development of alternative solutions to replace imported software.

The creation of consortia of companies was initiated in 2014 which consortia would allow to develop complex solutions based on the research works of a number of companies or to jointly promote domestic systems on the Russian market (especially in the public sector, including state-owned enterprises). In particular, the following consortia were created: BETA – to form a full stack of domestic software (or FSW) and to replace basic and

Assessment of the impact of bans on the use of foreign software in the presence of an analogue in the Register of Domestic Software on software development companies depending on the share of operation in developed markets, the share of surveyed companies in 2021

	All companies surveyed	Do not operate in far abroad countries	Operate in far abroad countries
Very negative (-3 points)	3.5%	3.8%	3.3%
Negative (-2)	8%	6%	10%
Negative, but negligible (-1)	6%	5%	8%
No impact (0)	45%	43%	47%
Positive, but negligible (+ 1)	16%	19%	13%
Positive (+ 2)	12%	13%	12%
Very positive (+ 3)		10%	8%
Average score	0.33	0.46	0.23
Found it difficult to assess	17%	20%	14%

application software for the banking sector) and UNION – to replace not only imported basic and application software for the oil and gas sector, but also to replace imported servers with domestic ones based on "Elbrus" processors.

There are doubts about the degree of effectiveness of the Register of Russian Software, which appeared in 2016 under the Ministry of Communications. As of the beginning of September 2022 14,492 domestic software products were registered in the Register (28% more than a year earlier, over the previous 12 months the increase was even more significant - + 62%) and 4706 copyright holders (their number has increased by 32% over the year).

A number of domestic developers consider this Register quite useful to ensure the imports phaseout process. The presence of such a large number of companies that register their software in the register also indicates the need for such an instrument, although this need was created artificially.

In June 2021 the Ministry for Digital Technology, Communication and Mass Media of the Russian Federation has developed a new, more detailed version of the classifier, which will be used as part of the register of Russian software. Its current version includes only 26 classes, while the new version is also divided into sections, and the total number of classes has exceeded 95. This classifier has yet to be studied with experts, but it is unlikely that it will radically change anything if it does not reflect the need to replace the complex of interconnected solutions. In many cases, these shall be hardware and software systems. However, in order to take advantage of the tax benefits provided by the state, in reality the developers of such complexes in

Russia still have to make their own choice – either software development or hardware development.

In the fall of 2021, the Ministry for Digital Technology, Communication and Mass Media announced its intention to thin out the register of domestic software and to remove about 1000 applications that do not meet the current requirements from the register. To implement this, the first audit of the register was performed in six years of this register existence, despite the fact that by the decision of the Government such inspections should be performed annually. At the end of October 2021, it became known that the Ministry has identified candidates for removal from the register of Russian software. The Ministry has conducted a large-scale audit, as a result of which about 900 products with irrelevant information in the description were found.

In February 2022 the Ministry for Digital Technology, Communication and Mass Media has announced the development of a regulatory framework to combine registries of domestic software and domestic hardware. The corresponding order to the Ministry was given by the Government.

The annual RUSSOFT survey (in spring 2022, the question about the attitude to the Register of domestic software was not asked due to the need to assess the significance of other problems) showed that on average, the assessment of the effectiveness of the Register of domestic software is not high.

In 2019 the average Register impact estimate for all surveyed companies approached zero - it decreased from 0.16 to 0.09. However, at the same time, companies that do not work in foreign countries began to evaluate this impact more positively - there was an increase

in the average score of the Register's utility estimate from 0.15 to 0.22 (which is still less than 0.25 obtained in the survey conducted in 2017). Companies operating in foreign countries rated the impact of the Register much worse – a drop was noted from 0.16 to a negative value (-0.01).

In 2020, there were no significant changes in the assessment of the effectiveness of the software imports phaseout policy, and due to the fact that the number of respondents was much smaller than in previous years, the analysis of estimates for certain categories of companies was not carried out (segmentation further increases the error).

In 2021, the average score of the assessment of the imports phaseout policy increased to a record value – 0.33 (which is still closer to zero than to "1"), which means that companies positively evaluate the bans on the use of foreign software in the presence of an analogue in the Register of domestic software, but consider the influence of such bans insignificant.

For service companies in general, the assessment of the significance of the Register is very low. The average score in 2019 was only 0.01, and in 2021 it became completely negative (-0.04). This figure has almost always fluctuated around zero in recent years. More than half of such companies (50-60%) traditionally do not see any impact of the Register on the IT market.

Software developers are much less likely to show indifference to the Register. Only 35-40% of developers of replicated solutions do not see any influence of the Register, while the average Register score in 2019 was 0.18, and in 2021 it increased to 0.70.

At the same time, 28% of companies that receive at least 50% of revenues from exports believe that the existing bans have a negative impact on them. Jointly with 56% of companies that indicated zero impact of the Register on the market, the average score was -0.28.

For companies that receive their main revenues in Russia, the attitude towards the Register is generally positive – the average score is 0.48, but it is still very low (the Register has no effect on 43% of respondents in this segment).

According to the survey the biggest benefits from the Register are received by product companies, having more than 50% of revenues from sales generated in the domestic market. But their average score was 0.78, less than the level of positive minor influence.

The survey conducted by RUSSOFT does not allow to exactly determine what negative impact the presence of the bans on the use of foreign software has in the availability of an analogue product in the Register of Domestic Software. We can only assume that due to the binding of the granted VAT benefit to the presence of software in the Register, some companies had problems with receiving such a benefit. An additional study was required on how bans on foreign software affect the software industry as a whole, but such a study may no longer be relevant due to the closure of Western markets for Russian companies.

In early summer 2022 the Government of the Russian Federation took the decision to establish industrial competence centers (ICC) for the replacement of foreign software and competence development centers (CDC) for the development of Russian system-wide and application software required to replace currently used foreign analogues.

It can be assumed that the formation of user groups can be carried out not only on an industry basis. Besides that, the principle of solutions division by classes may become different - with account for the fact that in many cases it is required to change not individual products, but complexes of interconnected systems (including software and hardware systems).

The idea of involvement of experts from the Software Development Associations to the ICC and CDCs seams correct: focusing on the opinion of exclusively employees of IT departments of client companies significantly narrows the requirements for the functionality of the replacement product, which does not allow making it a competitive product for the global market. This will lead to the fact that soon the client will again be forced to purchase imported software to ensure the competitiveness of the line of its main products. However, by the end of summer 2022 software developers did not understand how their information and proposals would be used in the ICC and CDCs: whether this information will be accounted for and what final decisions these centers will make based on the data collected from various sources.

Apparently, there is a lack of a systematic approach with a clear definition of how problems related to imports phaseout will be solved with the help of the ICC and CDCs. It is possible that systemic approach is not created due to the incorrectly chosen goal of the state imports phaseout policy. In fact, imports phaseout itself was declared to be the goal of the state policy. However, in the last 1-2 years another, more correct goal has started to be proposed ¬– to ensure technological (or digital) sovereignty.

In April 2022 this goal was voiced by Alan Salbiev, the adviser to the Ministry of Digital Development, Communications and Mass Communications of the Russian Federation, who made it point-blank: "The era of imports phaseout is over. The era of independence from imports has started. It is necessary to make sure that our practitioners in the field of imports phaseout do not have a single chance".

The difference between imports phaseout and the assurance of technological sovereignty is significant and fundamental, although not everyone understands it. Imports phaseout as a state policy is implemented in the form of a simple replacement of foreign solutions by domestic ones at procurement government made by agencies and state-owned corporations. Thus, the share of domestic software should somehow grow, and therefore targets were set for both the procurement and the use in the corporate sector. It was not clear in which units the shares of the domestic and foreign software used shall be evaluated, as well as how correctly the current indicators are determined. But in any case, this approach did not allow to guarantee the solution of the main problem – the elimination of risks and threats existing when using foreign software (unauthorized access to information, disabling systems contrary to the wishes of Russian users, refusal to supply and to provide technical support).

First of all, it should be noted that the process of imports phaseout can be influenced by various external factors (sanctions, devaluation of the ruble)

and by the improvement of domestic solutions, and not as a result of a well-thought-out state policy. In such a way this process went mainly all the last 20 years (drivers are described in the beginning of this section).

The idea of imports phaseout in the field of software initially arose in order to support domestic developers, which, through the improvement of their solutions in the competition with foreign developments will eventually phase them out on the Russian market. At the same time, it was assumed that Microsoft, Intel, Cisco, SAP and other Western vendors would be reliable suppliers of the "best in the world" solutions and will provide support for these solutions. In reality, there was no policy of financial incentives for users from the state sector to imports phaseout of software, imports phaseout was limited to a declaration of bans on the purchase of imported software.

Since 2014 it has become clear that software vendors in Western countries are not reliable partners and at any time can refuse to supply solutions and to provide technical support to Russian enterprises and organizations. As a result, the imports phaseout policy began to imply the achievement of independence from these companies.

By default, imports phaseout was assumed to provide independency from imports. However, this assumption is fundamentally wrong. Imports phaseout can assure independence from imports, but only theoretically, and does not warrant such independence. Firstly, the requirement to replace imported software with Russian software can be satisfied at the expense of those solutions that are not critical for the corporation or the government. Thus, the criterion of

imports phaseout can be fulfilled, and technological sovereignty will not be ensured, and dependence on Western solutions as a whole will remain at the same level.

Secondly, the required share of purchased or even used domestic software does not account for the fact that in many cases it makes sense to change the entire set of interconnected solutions to ensure technological sovereignty. The example of a large enterprise with a complex information system shows how the requirement to increase the share of domestic software looks like with no guarantees of independence from foreign vendors. Let's assume that the components of this system were initially only 10% domestic, but in a few years this figure was brought to 80%. At the first glance, it may seem that the imports phaseout process was more than successful. However, the remaining 20% may contain such foreign solutions, due to which the entire information system used may cease to function (for example, as a result of unauthorized access to these components, of the refusal to provide technical support or to make repair, where hardware is concerned).

Thirdly, the share of domestic software in monetary terms is a very unreliable indicator for monitoring the efficiency of technological sovereignty assurance. Russian solutions are sometimes 2-3 cheaper than foreign counterparts. In addition, technological sovereignty can be provided by free open source software, but also with no guarantees, because such software can also contain bookmarks for unauthorized access. For these reasons the main criterion for the success of imports phaseout is not an increase in the share of purchases of domestic software, but the assurance of technological sovereignty when using

certain solutions. It is possible that this goal can be achieved with no increase of the share of purchased domestic software.

In this situation, there are so many problems related to the assurance of technological sovereignty that the growth in revenues of domestic software companies will be restrained only by the lack of resources, and not by the rejection of requirements for the procurement of domestic software by state corporations. The share of domestic software in any case will grow even faster than in previous years. However, ideally, such an increase shall be a consequence of the technological sovereignty assurance, and not the result of meeting the criteria for the increase of the share of domestic software sales in the total volume of software purchases.

Since Russian companies do not have competitive developments in all types of software and hardware in the field of information technology, it is quite possible to purchase solutions from "friendly countries" or to develop them within the framework of international cooperation. Consequently, a decrease in the share of purchased domestic software can in some unique cases assure technological independence even to a greater extent compared to its formal increase. In this regard CAD systems for designing complex products or imported processors can be recalled. It will not be possible to completely abandon CAD and processors supplied by foreign manufacturers in the coming years, but the problem of dependency on their foreign suppliers refusing to work in Russia, can be much faster solved jointly with China and other "friendly countries".

3.2.3. International cooperation in the field of technological sovereignty assurance

Not only Russia faces the problem of technological sovereignty, but also many other countries, including large states such as China and India.

By imposing sanctions Western governments exert political pressure on various states – from China and Russia to Iran, Venezuela and Syria, while providing preferences to their own companies. Corporations in their own use or try to use their own monopoly position. There are already many similar examples.

For example, in 2019 the Turkish Competition Council drew attention to the fact that Android users on smartphones do not have the opportunity to choose a default search engine for themselves; so this Council issued a fine and ordered Google to amend the license agreement. In early 2020 Google left Turkey without its Android operating system and applications on new devices.

In April 2021 US authorities included the Chinese company Phytium in a blacklist of companies allegedly having ties to the Chinese military. Phytium is developing processors for supercomputers based on the ARM architecture. For this reason the Taiwanese company TSMC, the world's largest manufacturer of semiconductor products, was forced to suspend cooperation with it. The United States put pressure on Huawei using a similar scheme – in May 2020 supplies of TSMC chips to this company were banned.

Even in Western Europe attempts are being made to ensure independence from American solutions, but so far, judging by media reports, these attempts are not very successful. At the end of December 2021 it became known that another attempt to abandon Microsoft products in favor of alternative solutions failed in Germany. The authorities of the State of Hessen were unable to pick up

a replacement for the Teams messenger for schools due to bureaucratic delays. The results of public procurement of alternative software were invalidated. Since 2003 Germany has been trying with varying success to transfer the public sector and budgetary institutions to open source software and to eliminate the use of Windows, Microsoft Office and other Microsoft products. Apparently, there are no powerful incentives for such imports phaseout in this country yet, but it cannot be ruled out that they will appear in the future.

China already has plenty of such incentives. In spring 2022 the Chinese authorities obliged the public sector to completely get rid of foreign personal computers (PCs) within two years and to replace them with Chinese ones. More than 50 million computers are subject to replacement at central government offices, but in the end their total number will be much higher, since the imports phaseout campaign will definitely affect regional authorities too. The same incentives are in force in the countries of the Middle East, South and East Asia, Latin America.

Despite the fact that the readiness to assure technological sovereignty in these countries is very different, cooperation of Russia with almost all states striving for technological independence is possible in one form or another. It shall be possible to create joint platform solutions, to initiate the establishment of communities of programmers to build new solutions based on open source software, to transfer technologies and to train foreign partners to work with Russian solutions and tools. In any case, due to the increased volume of sales during imports phaseout and due to additional export revenues, Russian companies will receive revenues that they can use to develop domestic and joint solutions that will be an alternative

to the systems and applications of companies in "unfriendly countries."

The situation in the global and Russian markets is such that in order to successfully promote their solutions and services abroad, Russian companies need to join forces at various levels - from coordinated development to joint marketing.

Firstly, there are no companies in Russia with billions of annual revenues that can on equal grounds compete with world leaders in terms of turnover and, therefore, in production costs and marketing budgets. Even the largest Russian software company Kaspersky with annual revenue of about USD 700 million recognizes the need for cooperation, which can be carried out, among other things, at the level of information exchange.

The management of Kaspersky believes that the more Russian companies will act in a certain market (especially in countries that are quite exotic for these companies), the easier it will be to do business in this market and to develop the market itself. Essentially, successful Russian IT exporters are ready, if possible, to help newcomers even free of charge. Especially if these newcomers can become potential technology partners.

Secondly, according to the Russian Export Center, there is a demand in emerging markets for complex turnkey solutions. As a rule, customers refuse to independently develop such solutions and are waiting for an appropriate offer from suppliers. Such solutions require the unification not only of different software developers, but also require cooperation with custom software developers, system integrators, distributors, hardware manufacturers. Similar requests for complex solutions

and for large integrators are available on the Russian market too.

This topic is especially close for RUSSOFT, since the Association was established based on the decision made in 1999 by several companies to unite, on the grounds of their understanding how small they are in the American market. Promoting cooperation of Russian software companies is one of the strategic tasks of the Association.

Thirdly, the imports phaseout process is often impossible without comprehensive solutions offering. The fact is that Western hardware manufacturers and software developers have created the addiction of their clients to interconnected solutions. In many ways, this addiction was created deliberately and artificially in order to bind corporate clients (private users also) to these hardware manufacturers and software developers. For this reason the replacement of one component of the telecommunications or IT infrastructure with another is either impossible or very difficult without compromising the reliability of the systems used.

Therefore, the substitution must be complex.

Sometimes the contingency of only two software products is enough, but more often a single software and hardware complex is required. It is not the first year that RUSSOFT is proposing to stimulate the establishment of such complexes at the state level within the framework of the imports phaseout policy and to support export activities of these complexes through the use of the entire range of tools of the Russian Export Center.

GEOGRAPHY AND VERTICAL MARKETS OF RUSSIAN SOFTWARE COMPANIES

4

4.1. Russian Market and Global Presence

For a long time, export-oriented operations of Russian software developers supported the rapid growth of their revenues, regardless of the situation in the domestic market. The attractiveness of the domestic market increased after 2014 due to the events in Ukraine and due to the associated acceleration of the imports phaseout process. In subsequent years the growth rate of domestic developers in the domestic market was high or quite high (except for the time of crisis in 2015). And although the Russian software market could expand only by 3-5% per year, this did not prevent Russian companies from growing their sales on this market by 10-20%, and in some years by more than 20% (in 2016, due to the deferred demand, the increase in ruble terms was even 34%).

The introduction of numerous new sanctions aimed at undermining the Russian economy in 2022, and the exit from the Russian market of almost all large companies representing the United States and other NATO countries, provided work for Russian software developers for years to come. Therefore, the growth of sales in the domestic market in the next few years will be limited only by the state of the economy and the availability of specialists. Consequently, the expected annual increase in revenues from the implementation of software development solutions and services within Russia can amount to 15-20%.

The many-years analysis conducted by the RUSSOFT association allows concluding that work in the domestic market and work for export are closely interconnected. The experience of cross-border projects implementation allowed Russian service companies to create complex information systems in Russia both for government agencies and large and not very large commercial enterprises. Due to its global presence, product companies received export revenues, which provided the investments required to develop their solutions and to market them around the world, including in Russia.

At the company level, the benefits of working both in Russia and abroad were also obvious. On average, the growth rate of companies with a significant share of exports (at least 25%) was much higher than that of enterprises whose presence was limited only to the markets of Russia and near abroad countries. Perhaps, by the end of 2022, exporting companies will not have such an advantage, since they have too many problems with operation in Western countries, and reorienting to the Russian market or other friendly markets will not allow them to compensate for unexpected and significant losses of these companies during the year. Nevertheless, in terms of the strategic development of both individual software companies and the entire industry, the export direction remains as important as before. Perhaps it becomes even more important, given the division of the market into "friendly," perceiving Russia as a source of technological sovereignty (primarily in the field of IT) and "unfriendly," which at any moment can stop the provision of modern technologies. A fundamentally new situation has emerged in the world market that favors the promotion of Russian IT solutions, technologies, and services.

In terms of population, the "friendly market" presents the biggest part of the world. Since digital sovereignty assurance in the countries of the Middle East, Africa, Latin America, and Asia (with Oceania) about the same problems as those existing in Russia have to be solved, the link of operations in the domestic market with cross-border operations becomes even closer. Moreover, some complex tasks that require significant resources (human, investment, organizational) can be solved jointly with states that have set a course to technological independence from Western countries.

5-7 years ago, the heads of service companies did not see any special prospects for working in the markets of countries that are commonly called developing ("they are incomprehensible," "the return on investment in marketing is several times less than in Western countries," "there are local competitors whose cost of services is lower than in Russia"), but in recent years the attitude towards these markets has changed dramatically. The volume of information required to start operations in the countries of Asia, the Middle East, Latin America has increased. In addition, it turned out that with a lower wage level on average, in a number of countries there are simply no specialists with the experience and qualifications required to develop complex information systems.

In the last 2-3 years most companies with 20-30 percent or more of their turnover coming from export to Western countries, started sales or at least showed an intention to sell their custom software development services in developing countries (even in Africa). There are already many companies among product companies that have been working successfully in these countries for a long time. After the start of a special military operation in Ukraine it became almost impossible not to consider this alternative to the markets of Western countries in case companies wish to develop globally.

With the gradual reorientation from some foreign markets to others over the past few years, Russian software companies have formed an almost ideal ratio of export revenues and revenues from operations in Russia. In 2018-2019 the

growth rate of sales at home and abroad differed, but the difference was not very large. In 2018 the revenues received in Russia grew faster, while in 2019 the growth of revenues from cross-border sales was faster. At the end of 2020 full parity was established – the increase in sales both in the domestic market and outside Russia turned out to be approximately 16% in ruble terms. In terms of dollars and rounding to tenths of a percent, sales in the domestic market have a slight advantage in terms of growth rates. Domestic sales added 4.5% while foreign sales increased by 4.3%.

According to the results of 2021, absolute equality was reached for the increase in sales in the Russian and foreign markets (+19% in ruble terms and +17% in dollar terms). At the same time, the volumes of these sales are quite comparable: USD 10.07 billion collected from exports, USD 11.1 billion collected from operations in the domestic market (47.5% and 52.5% of the total turnover of Russian software companies). In order to consider the development of the industry absolutely balanced, the growth rate could probably be slightly higher. With an account for the resources available in Russia, an increase in total revenue can be theoretically assumed equal to 20-25%.

The transformation of the interest of software developers in working abroad and in operations in Russia can also be traced by the share of companies that do not have export revenues at all. However, herewith it will be required to account for the way the structure of the array of surveyed companies is changing. The share of exporters among surveyed companies for various reasons seriously changes from year to year, and these reasons do not always reflect the existing proportions in the general population.

At the end of 2017 24.8% of surveyed companies had a zero export indicator,

while at the end of 2018 the number of such enterprises was about 1.5 times higher – 35.6%. At the same time, most of the companies that participated in the survey in the last 2 years (a quarter of those surveyed in 2019) showed a decrease in the share of exports (including to 0%). As a rule, these are small companies for which cross-border operations in 2017 provided no more than 10-15% of revenues. Large custom software developers have also increased sales in Russia.

In 2019 the share of companies with no export revenues decreased to 14.3% (it became less than in 2017). However, it should be borne in mind that, firstly, not many companies participated in the 2020 survey (72 questionnaires), and secondly, a large share of participants of the survey (61%, which is much more than 20-30% in previous years) was made up of members of the RUSSOFT Association, which has historically been an association of software exporters. The share of respondents with no export contracts by the end of 2020 increased to 29.6%, and this growth does not indicate a clearly increased interest in the domestic market. This growth is explained by the fact that it is especially difficult (usually impossible) to find customers in other countries for small companies that have not yet earned a reputation abroad and to conclude contracts online. Such companies (with a turnover of less than RUB 320 million) have increased export revenues by 6.5%, and larger ones – by 12.8%.

At the same time, according to the results of 2021, the absence of export revenues was indicated by 42.1% of surveyed companies. This growth is primarily due to the fact that in spring 2022 when the survey was conducted, exporters working in the markets of Western countries had to urgently solve the problems associated with the receipt of payments

for previously completed works and to change their development strategy. As a result, the share of such companies in the total mass of enterprises covered by the survey has decreased significantly.

Other indicators suggest that there has been no such sharp increase in the share of companies with no export revenues (which means a sharp decrease in the number of exporters) throughout the industry. Firstly, 3.5% of the companies participating in the survey in 2022 had export revenues in 2020 reduced to zero in 2021, but at the same time, the same number of companies had foreign sales in 2021 in the absence of export revenues in 2020. This means that some companies have lost their "exporter" status while others have acquired such status in the same amount. Secondly, the share of exports has decreased in 2021 compared to the same indicator in 2020 in 20.7% of surveyed companies and has increased in 21.4% of companies. It indicates a completely insignificant difference. Thirdly, the absolute value of export revenues has increased in 38.6% of surveyed companies and has decreased – only in 17.9%.

Nevertheless, long-term observations of the state of the industry with the current fluctuations allow concluding that the share of surveyed companies not having export revenues has nevertheless increased slightly over the past 5 years. There are reasons to believe that 30-35% of all software industry enterprises did not have export revenues in 2021, 25-30% did not have experience in foreign markets (even in near abroad countries). According to the expert assessment, based on the experience of conducting various (not only annual) RUSSOFT studies, at least 20% of Russian software development companies are basically not ready to enter foreign markets. Consequently, 5-10% of companies that do not have any international experience

may well become exporters in the next 2-3 years and many of them already have the corresponding intentions.

With a declining share of exporters for a particular year (preceding the annual RUSSOFT survey), the focus on entering foreign markets is very high. If companies with absolutely no export revenues in 2021 are considered, 26.3% of these companies (almost 9% of all surveyed enterprises) have an intention to enter a foreign market in 2022. The most attractive markets are those in near abroad countries (15.8% of all companies without export revenues in 2021), South and East Asia (10.5%), and the Middle East (10.5%). Some of the companies that have foreign expansion plans will not debut in foreign markets but will return to them.

Most likely, not all intentions to return or to enter foreign markets for the first time will be confirmed by real projects already in 2022. The desire to expand in foreign markets covers a wide range of Russian software companies, but with limited resources, they have to choose between real opportunities to increase sales in the domestic market and hypothetical prospects for entering new foreign markets. The choice is often made in favor of working in the Russian market, in which the situation is very favorable for the increase in sales.

Interest of companies with no export revenues in 2021 to foreign markets (share of such companies planning to enter specific markets in 2022)

15.8%	10.5%	10.5%	7.0%	3.5%	3.5%	1.8%	0%
Near abroad countries	South and East Asia	Middle East	South and Central America	Africa	Europe (without Russia and near abroad countries)	USA and Canada	Australia
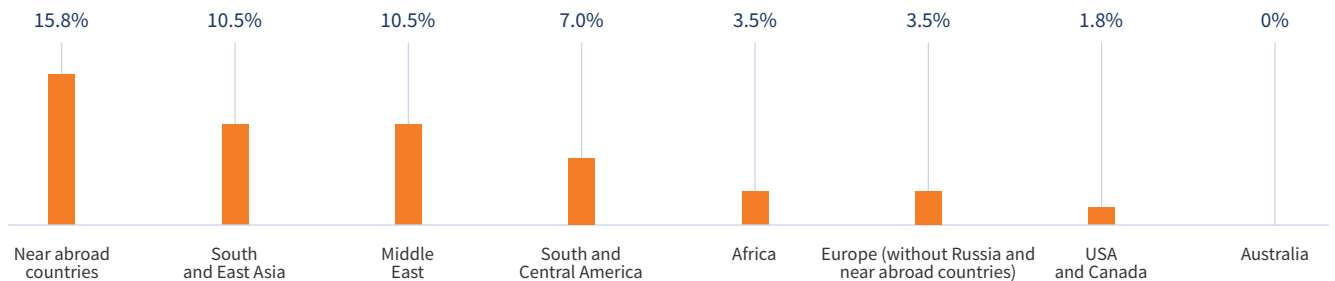
At the height of the pandemic in mid-2020, RUSSOFT made the following forecast: "Companies that have managed to gain a foothold in foreign markets will have indicators no worse than companies that did not work outside Russia and near abroad countries. Reorienting to the domestic market from foreign markets is much easier than the other way around. " This forecast turned out to be correct and gained the status of a rule. Only in times of rapid growth of the domestic IT market (by tens of percent) could this rule have exceptions in some years. This rule once again worked when summing up the results of 2020: companies with an export share of less than 25% increased turnover by 1.4%, with an export share of less than 50% – by 4%, and by 21.7% with an export share of more than 50%.

However, judging by the survey data, the results of 2021 no longer confirm this rule: companies with an export share of less than 25% increased turnover by 21.4%, with an export share of less than 50% – by 22.5%, and with an export share of more than 50% – by 14.6%. Notably, these average revenues increases are specific to the companies surveyed, and as noted above, a significant proportion of successful exporters were unable to participate in the survey. At the same time, some exporters moved from the "more than 50%" category to the "less than 50%" category. Since exports of all software enterprises and their sales in the domestic market grew equally, it can be argued that the export has provided no less growth than operation in the domestic market.

Relative to 2022 it can be assumed that companies with a relatively low share of exports will have better growth indicators. On the one hand, the attractiveness of the domestic market has increased, on the other hand, Russian software exporters have serious problems in the markets of Western countries, and it is impossible to quickly reorient to other foreign markets. It is not improbable that in 2023 it will not be possible to compensate for losses in the western direction with an increase in sales revenues in Asia, the Middle East, South and Central America, and Africa.

Nevertheless, when considering a longer period, a larger share of export revenues provides a higher rate of turnover growth. The mistake was that exporting

companies, operating mainly in the markets of Western countries, delayed entering other markets, not believing in their potential attractiveness in the future and not predicting the risks of turning "Western" countries into "unfriendly." RUSSOFT for about 10 years has pointed out that there are large foreign markets underestimated by Russian software companies, but the reorientation to them was not fast enough.

In the last 4 years (2018-2021), software developers are better able to expand their business at the account of foreign markets. This phenomenon is not affected either by fluctuations in the ruble exchange rate against the dollar or by a pandemic.

Apparently, the Russian market for product companies is already too tight. However, the process of imports phaseout is very active in some of its segments. For example, this applies to basic office software – operating systems and office applications. Companies operating in this segment can grow by tens or even hundreds of percent per year without going abroad, but their total turnover relative to all developers of replicated solutions is not yet great.

Growth rate of exports of service and product companies and their sales in the domestic market in 2020-2021 (in dollar terms)

| | 2020 | | 2021 | |
	export	domestic sales	export	domestic sales
services	+0.5%	+11.5%	+7.9%	+15.6%
products	+5%	+0.7%	+18.2%	+14.3%

4.2. Distribution of Sales by Macro-Regions of the Global Market

Since 2015 RUSSOFT has acquired data on the sales of Russian software companies in various macro-regions of the world. Prior to this the importance of certain regions of the global market was assessed only by the number of surveyed companies that indicated their presence in a particular part of the world.

As practice shows, calculations have a large error, and the share of each macro-region strongly depends on the activity of those companies with a large share of exports in their turnover, participating in surveys. At the same time, when considering the period of several years (or from the beginning of these calculations) and with account

for way the structure of the array of surveyed companies has changed, it is quite possible to get a general idea of the existing distribution of sales by macro-regions. This distribution was confirmed by the data of the Central Bank of the Russian Federation on the receipt in Russia of export revenues for computer services provision from different countries. If there were serious deviations, they had explanations. The fact is that software developers can receive revenues either directly from the country in which they worked, or through the offshore zone, or through regional hubs (for example, Cyprus, Luxembourg, Hong Kong, Singapore). For example, a higher figure of Ukraine in RUSSOFT

calculations compared to the data of the Central Bank of Russia indicated that it is difficult for Russian companies to work directly in the market of this country. They sell software to Ukraine under the guise of European developers.

It should be borne in mind that customers from near abroad countries often have offices in Russia, which means they can pay for the software delivered from the bank account of a Russian legal entity. Therefore, the share of "neighboring (near abroad) countries," which according to RUSSOFT calculations amounted to 5-7% in 2019-2020, most likely, was seriously underestimated.

Distribution of sales of Russian software companies by macro-regions of the Global Market in 2016-2021, % of the total turnover (calculation of the significance of specific markets)

	2016	2017*	2018	2019	2020	2021
Russia	37%	49.5%	55.3%	52.4%	52.5%	52.5%
Near abroad countries (former Soviet Union)	—	—	—	4.7%	7.3%	13.45%
USA and Canada	17.7%	17.1%	13.0%	16.3%	13.0%	11.8%
Europe (without Russia and near abroad countries)	—	—	—	13.6%	12.4%	12.2%
South and East Asia	5.5%	4.0%	4.0%	3.8%	6.5%	2.9%
South and Central America	1.8%	1.5%	1.6%	2.6%	2.7%	2.4%
Africa	1.1%	0.5%	0.6%	2.1%	1.4%	0.3%
Australia	1.6%	0.9%	0.9%	2.4%	0.7%	1.25%
Middle East Countries	1.2%	1.3%	1.4%	2.1%	3.5%	3.2%

* — since 2017 the share of sales of Russia was determined by more accurate calculations of the total turnover and total foreign sales of Russian software companies, and not by the indicated significance of the markets.

When summing up the results of 2021 the calculation was greatly influenced by a reduction in the share of surveyed companies with an export share of more than 25% (from 27.4% to 18.1%). Such a reduction could not be in the general population.

With account for random fluctuations the approximate distribution of all sales in 2021 by macro-regions will be as follows: Russia – 51-53%, CIS countries – 8-10%, USA and Canada – 13-15%, Europe (without Russia and near abroad countries) – 12-13%, South and East Asia – 5-7%, South and Central America – 2.5-3%, Africa – about 1%, Australia – about 1%, Countries of the Middle East – 3-5%.

RUSSOFT 2019 data is difficult to directly compare with similar data from the previous few years. First, because the division of the global market has changed. Secondly, due to the fact that calculations were performed in a different circle of companies (in 2019, the revenues of several large companies that ceased to be Russian according to the RUSSOFT classification were not accounted for). In addition, a slightly changed methodology of the total turnover and total foreign sales calculation was used.

The 2020 distribution is calculated based on the data obtained as a result of a full-fledged survey (as opposed to the 2019 distribution). For this reason it is more correct to compare the data of 2020 with the data of 2018, but with account for the slightly changed methodology.

Traditional markets for the Russian IT industry are the Western World and the former Soviet Union countries. "Western World" is presented in the general table with the distribution of sales by macro-regions as follows: "USA or Canada," "Germany and German-speaking countries," "Scandinavia and Finland," "Other countries of Western Europe," "Australia" and "Countries of Central and Eastern Europe," which are currently still becoming closer to the Western world (especially since they are all members of the EU). Apart from Russia the "Former

Soviet Union," stands for Belarus, Ukraine, Kazakhstan and Uzbekistan.

"New Markets" are divided into the following macro-regions: "South and East Asia," "Africa", "South and Central America" and "Middle East".

Grouping markets allows to increase the accuracy of calculations, but still these markets need to be adjusted. For example, data of 2021 incorrectly reflects the growth of Russia's share along with near abroad countries. If such growth was present (due to a faster increase in exports in the former Soviet Union states), then not from 60% to 65%, but only by 1-2 percentage points. The share of Russia has not changed at all. Most likely, the share of "New Markets" exceeds 11% in reality and has not changed significantly over the year, and the share of "Western World" is 27-29%, and not 25%, but over the year it also remained almost unchanged (just in this case, the calculations did not reveal this change).

Distribution of sales of Russian software companies by market groups

	2015	2016	2017	2018	2019	2020	2021
Russia and near abroad countries	59.4%	61.1%	54.8%	60.6%	57.1%	60%	65.95%
Western World	34.7%	32.0%	37.9%	31.8%	32.3%	26.0%	25.25%
New markets	5.9%	6.9%	7.3%	7.6%	10.6%	14.0%	8.8%

If we consider the period since 2015, then we can quite confidently talk about the growth of the share of "Russia and other countries of the former USSR" and "New Markets" while reducing the share of "Western World." The growth of the Western World market indicator in 2017 can be considered an episode related to the devaluation effect.

Such changes are supported by data on a significant increase in sales in the domestic market and an increase in the number of news reports on activities in "New Markets".

4.3. Presence of Russian Software Companies in Foreign Markets

Interest in various markets can also be assessed by the share of companies' presence in these markets and by the respondents' assessment of the importance of each market (whether there are key or only individual projects implemented in this market).

Most often, the United States/Canada (8.2%), Europe (7.0%) and near abroad countries (5.3%) were recognized as the key foreign market in 2021. In the remaining macro-regions, the proportion of presence did not exceed 3%.

Presence of software companies in domestic and foreign markets in 2021 with assessment of their significance, % of surveyed companies

	The market is a key market	Only individual projects are implemented in this market	Presence
Russia	87.7%	7.6%	95.3%
Near abroad countries	5.3%	39.2%	44.4%
Belarus	2.3%	22.2%	24.6%
Ukraine	0.6%	11.7%	12.3%
Kazakhstan	1.2%	28.6%	29.8%
Uzbekistan	0.6%	16.4%	17.0%
USA/Canada	8.2%	15.8%	24.0%
Europe (without Russia and near abroad countries)	7.0%	28.1%	35.1%
Great Britain	1.2%	8.2%	9.4%
France	1.2%	8.2%	9.4%
Italy	0%	4.7%	4.7%
Germany and German-speaking countries	2.9%	12.3%	15.2%
Northern Europe (Scandinavia and Finland)	1.15%	9.35%	10.5%
Central and Eastern Europe	1.75%	12.85%	14.6%
South and East Asia	1.15%	16.95%	18.1%
China	0.6%	5.3%	5.9%
Japan	0%	4.70%	4.7%
India	0.6%	5.3%	5.9%
Africa	0.0%	5.9%	5.9%

	The market is a key market	Only individual projects are implemented in this market	Presence
South and Central America	2.3%	7.6%	9.9%
Brazil	1.2%	4.1%	5.3%
Mexico	0.6%	3.5%	4.1%
Argentina	0.6%	3.5%	4.1%
Middle East	2.9%	11.1%	14.0%
Australia/New Zealand	1.2%	4.7%	5.9%
Markets Grouping			
Developed Markets	12.6%	34.1%	46.7%
New markets	4.2%	24.0%	28.2%

If we compare the indicators of presence in certain markets in 2021 with similar indicators in previous years, the reduction is present in almost all markets. This is due to the fact that many companies with a wide sales geography and a large share of exports were unable to take part in the 2022 survey.

The share of companies that had business in Kazakhstan, Belarus and Uzbekistan increased, which may be due to the beginning of the transfer of exporters of their business from Russia to neighboring countries to escape the sanctions. The reduction

in Ukraine's share is too large to be explained by these random fluctuations. It undoubtedly reflects the real situation, although a threefold drop in the share of companies operating in the Ukrainian market seems unlikely (most likely, this drop was less).

Presence of Russian companies in domestic and foreign markets in 2007-2021, % of surveyed companies

	2007	2013	2014	2015	2016	2017	2018	2019	2020	2021
Russia	55%	93%	94%	92%	87%	93%	94%	90%	99%	95%
Former USSR countries,	—	—	—	—	—	—	—	44%	49%	44%
Kazakhstan	—	—	—	—	—	—	—	36%	26%	30%
Belarus	32%	33%	27%	33%	28%	29%	26%	32%	19%	25%
Ukraine	17%	39%	30%	32%	25%	23%	20%	28%	36%	12%
Uzbekistan	—	—	—	—	—	—	—	24%	16%	17%

	2007	2013	2014	2015	2016	2017	2018	2019	2020	2021
USA and Canada	55%	41%	48%	36%	37%	42%	39%	58%	32%	24%
Europe (without Russia and near abroad countries)	—	—	—	—	—	—	—	51%	42%	35%
Great Britain	—	—	—	—	—	—	—	28%	16%	9%
Germany (German speaking countries)	25%	22%	24%	27%	19%	31%	29%	33%	11%	15%
France	—	—	—	—	—	—	—	19%	10%	9%
Italy	—	—	—	—	—	—	—	21%	17%	5%
Scandinavia (with Finland)	28%	17%	17%	18%	16%	20%	21%	22%	12%	11%
Countries of Central and Eastern Europe	—	—	—	—	16%	20%	21%	24%	16%	15%
South and East Asia	19%	8%	12%	15%	13%	16%	17%	26%	22%	18%
China	—	—	—	—	—	—	—	24%	10%	6%
Japan	—	—	—	—	—	—	—	10%	4%	5%
India	—	—	—	—	—	—	—	15%	9%	6%
South and Central America	—	—	—	8%	8%	14%	10%	17%	9%	10%
Brazil	—	—	—	—	—	—	—	10%	10%	5%
Mexico	—	—	—	—	—	—	—	10%	5%	4%
Argentina	—	—	—	—	—	—	—	7%	5%	4%
Africa	—	—	—	9%	7%	10%	8%	17%	3%	6%
Middle East	—	8%	6%	9%	11%	16%	19%	21%	13%	14%
Australia	—	—	—	8%	10%	16%	12%	15%	8%	6%

Data on companies' interest in various markets obtained as a result of the survey conducted in 2022 (the answer to the question "are already working or are planning to enter these markets"), the change in the structure of the surveyed companies had a strong impact (reduction in the share of companies with a wide business geography and a high share of exports in turnover) as well as the fact that the questionnaire reflected plans for the current year only (previously, respondents had the opportunity to reflect plans for the next year). The results of the survey conducted in 2022 show a decrease in interest in almost all foreign markets. However, for most countries and macro-regions, this decrease in reality either did not occur, or it was not as significant as presented in the corresponding table. Some interesting conclusions can be drawn with account for the features of the survey conducted in 2022.

The U.S. market is still the largest. For this reason Russian software developers, who have already secured a foothold in this market, do their best not to leave it. Although every year it becomes more and more difficult for new companies to enter this market, the share of companies that planned their debut in the American market in the current and in the next year (relative to the year of survey) from 2016 to 2019 grew steadily, increasing from 8% to 13% over 4 years. The survey in 2020 did not turn out to be complete due to the pandemic, and therefore its results are not indicative, and in 2021 this indicator remained at a fairly high level (11.6%).

In 2022, only 1.8% of surveyed companies planned to start or resume operations in the US market in the current tear (in relation to the year of survey). This indicator decreased by almost 4 times, which cannot be explained in any way by a change in the structure of the array of

surveyed companies (it could maximum result in a decrease of 1.5 times). The attitude towards the prospects of the European market (without Russia and near abroad countries) have also worsened, but the fall in the corresponding indicator was still less than that for the United States – from 7.8% to 3.0%. The European market is still much closer to Russia, although the projected economic crisis in the EU countries may lead to the fact that entry into it will be possible for the same share of companies as the share of those companies which can debut or return to the US market. Most likely, access to these markets will be carried out (if at all) not directly, but through offices in neutral countries (for example, established in Turkey, Georgia or Armenia).

The interest in the markets of near abroad countries has not changed on average. Kazakhstan and Belarus, most likely, remained as attractive as in previous years. Ukraine has become almost of no interest to anyone, and the number of companies wishing to work in the Uzbek market has clearly increased. It seems that serious economic and social changes in the country which have caused more active participation of Russian software developers in various events that were held in Uzbekistan in the last 2 years. Delegations traveled to this Central Asian country with the support of the Russian government and development institutions.

The share of those wishing to enter new markets in the South and East Asia has increased significantly. When considering relevant plans only for the current year in relation to the year of survey, the indicator in 2022 (in comparison to that in 2021) has increased from 5.3% to 9.6%. The increase in interest in the Indian market is especially great - the share of those planning to enter it increased from 2.4% in 2021 to 7.2% when surveyed in 2022.

The attractiveness of working in local markets also increased in the South and Central America (corresponding indicator has increased from 4.9% to 7.8%) and in the Middle East (the increase from 4.4% to 8.4%).

According to a survey conducted in spring 2022, 23.4% of surveyed companies planned to enter a foreign market new to the company for the first time in the current 2022, and 19.2% of surveyed companies planned to enter the market of far abroad countries. A year earlier corresponding figures were almost the same. At the same time, the results of the RUSSOFT annual study indicated that the existing plans in the last 5-7 years have almost never been confirmed by actions: with all intentions to enter foreign markets more actively, Russian developers accelerated sales in the domestic market.

Share of companies interested in different markets

	2021 Survey Data			2022 Survey Data	
	The interest is present *	Planned to enter the market in 2021	Planned to enter the market in 2022	The interest is present *	Plan to enter the market in 2022
Near abroad countries	63.1%	9.7%	4.4%	52.7%	7.2%
Kazakhstan	48.1%	8.3%	3.9%	37.1%	6.6%
Belarus	35.9%	5.3%	4.9%	28.7%	3.6%
Ukraine	24.8%	3.9%	1.5%	13.8%	1.2%
Uzbekistan	26.7%	6.8%	4.4%	27.0%	9.6%
USA and Canada	43.2%	6.8%	4.9%	26.4%	1.8%
Europe (without Russia and near abroad countries)	56.8%	7.8%	6.8%	38.9%	3.0%
Great Britain	19.9%	2.4%	1.5%	11.4%	1.8%
Germany (German-speaking countries)	26.2%	6.3%	2.9%	16.8%	1.2%
France	14.1%	1.9%	1.5%	12.0%	2.4%
Italy	13.6%	1.5%	1.9%	7.2%	2.4%
Scandinavia (with Finland)	16.5%	2.4%	1.9%	11.4%	0.6%
Countries of Central and Eastern Europe	25.2%	4.9%	4.4%	16.8%	1.8%
South and East Asia	33.0%	5.3%	5.9%	28.1%	9.6%
China	15.5%	2.9%	2.9%	10.8%	4.8%
Japan	8.7%	1.9%	2.9%	6.6%	1.8%
India	12.1%	2.4%	1.0%	13.2%	7.2%
South and Central America	19.4%	4.9%	4.4%	18.0%	7.8%
Brazil	11.2%	2.9%	3.4%	7.2%	1.8%
Mexico	8.3%	2.9%	0.5%	6.0%	1.8%
Argentina	7.3%	2.4%	1.5%	6.0%	1.8%
Africa	16.0%	2.9%	3.9%	13.2%	7.2%
Middle East	20.9%	4.4%	3.9%	22.8%	8.4%
Australia	12.6%	1.9%	2.9%	8.4%	2.4%

* — already present in the market or planned to enter the market in 2021-2022 during the 2021 survey
** — are already in the market or are planning to enter the market in 2022.

4.4. Emergence of "Problem Markets" due to the Escalation of Political Tensions

In terms of sales of Russian software companies, the US market in 2021 as in previous 20 years has retained the second place (after Russia), but the gap from European markets in the last 2 years has become very insignificant.

It is known that for the largest Russian exporters, the share of sales in the United States in total revenues was often measured by tens of percent, and sometimes reached 50% and even 80%. Service companies were more active in the US and EU markets than product companies. However, for leading product companies, the US market provides very significant volumes of export revenues. An illustrative example is Kaspersky, a leading Russian developer of solutions in the field of information security, which in former times has annually earned up to USD 200 million in the US market, but 5-7 years ago, this figure started to decline (to about USD 150 million according to reports in the American media in 2017). Most likely, the decline in sales in the American market continued, although according to the company itself, its fall in 2020 did not occur.

Summing up the results of 2021, Kaspersky did not report anything about sales in the US market, but with a total revenue growth of 6.5% in dollar terms, the revenues from operations in the Russian market increased by 28%, by 16% in the Middle East, Turkey and Africa (META region), by 11% in Latin America, by 4% in Europe, and by 3% in in Asia-Pacific. Therefore, it can be assumed that sales in the United States did not grow at best, but most likely declined.

This example demonstrates how, under the influence of propaganda and administrative pressure, Russian developers have gradually been pushed from certain markets (primarily the countries of the European Union, the USA, Canada and Ukraine, where the media are campaigning to create a negative image of Russia). Government agencies were not allowed to purchase Russian software in any form at all, and commercial companies were not recommended to do this.

Apparently, from the spring of 2022 it will become even more difficult to operate in the markets of the USA, Canada and the EU, which will lead to a sharp reduction in sales of Russian legal entities. The delivery of software from Russia directly to these markets has become almost impossible (if only because it is impossible to receive payments for the transferred solutions and works executed). Therefore, some companies that depend on working in these markets either closed their business in Russia, organizing the departure of some of their specialists abroad, or created representative offices in neutral countries through which they intend to continue operations in the markets of "unfriendly" countries.

Most likely, the sales of Russian software companies in Western markets will not be completely close to zero for some time (it can be assumed that their calculations will become very complicated, since domestic developers will try to make information about their work in the West confidential or even secret). Commercial companies will not want to change suppliers of custom software from Russia if a long-continued cooperation has already been established with them. Replacing Russian software products is also far from always possible. Even US government agencies quickly failed to abandon Kaspersky's solutions, although they were under pressure to do this.

Against the background of the need to maintain the budget and to improve the quality of software, phaseout of Russian custom software developers from the American market can also be a difficult task. At the end of June 2019, it became known that the software for the crashed Boeing 737 Max aircraft was created by Indian programmers who were hired by American contractors to develop applications. This was reported by Bloomberg, a reputable publication in Western countries.

Consequently, not only the Russian side, but also the American side suffers from a political aggravation. Mutual dependence in the IT sphere turned out to be quite high. It remains to be seen which side of the conflict will suffer more from Western sanctions policies. Maintaining sales in Western markets at all costs seems to be a strategic misjudgement of the management of those companies that have stopped their developments in Russia. Most likely, the business of such companies is already being divided into a foreign one, which has retained the brand and has offices outside of Russia, and a Russian one, which is gaining a new brand and is operating under the Russian jurisdiction.

At the same time, Russian developers are now unlikely to be able to expand their business in Western countries or to enter their markets for the first time. There may be exceptions, but expansion as a mass phenomenon has become impossible.

4.5. "New Markets"

For more than 30 years, Russian software companies have had the main sales in the domestic market, in the market of near abroad countries and in the markets of Western countries (EU, USA). These sales account for at least 85% of total revenues of software developers, and 15-20 years ago this figure was close to 100%. Other markets (Asia, the Middle East, Latin America and Africa) are still not fully studied and understood by Russian software companies. That is why they are referred to as "New Markets."

Judging by the results of the 2022 survey, 41.3% of surveyed companies have interest in the markets of Western countries (they either already work in these markets or plan to enter them in 2022), and have interest in "New Markets" – 38.9%. These indicators are almost no different. At the same time, the dynamics are not in favor of Western countries. However, in absolute terms "New Markets" so far (according to the results of 2021) generate 1.5-2 times less revenues than markets of Western countries.

Based on Gartner and IDC data, the US and EU account for approximately 60% of global IT spending (including telecom services), while "other" markets account for 40%. Earlier, RUSSOFT pointed out a huge discrepancy between the distribution of sales and the capacity of markets, believing that all exports to far abroad countries should be distributed in accordance with the size of markets. In the future, the share of "New Markets" in this export should be slightly more than 40%. It was assumed that sales to the countries of the Western world remained at a high level and would also grow, but more slowly.

The proportions of 40/60 in the distribution of sales between "New Markets" and "Western Markets" in recent years have been achieved or almost reached. However, starting from spring 2022, circumstances force us to set another task – sales in "New Markets" should fully compensate for the losses from the closure of markets of Western countries for Russian companies. In part, this compensation is also possible due to increased sales in Russia and in near abroad countries.

4.6. Geographical Preferences of Service and Product Companies

Service companies specializing in custom software development initially (they began to appear en masse in early 90s) worked only in the markets of Western countries. Until 2005-2010, neither the Russian market nor any other markets were of interest to these companies. Only a few years ago service companies started to implement projects in Russia, until that time they received most of their revenues (up to 90-95%) from operations in the USA and Europe. Individual service companies have customers only in Western countries, but these are small enterprises that are not able to have a wide geographical representation of their business.

By 2019-2020 all service companies with a turnover of more than USD 10 million could not ignore the Russian market. In 2021, only two outsourcing companies participating in the RUSSOFT survey (out of 68) did not have revenues generated in the domestic market. The turnover of one of these companies was about USD 5 million, and the turnover of the second company was even less – its revenues slightly exceeded USD 0.5 million. At the same time, they were not limited only to the markets of Western countries, but also worked in near abroad countries and in Latin America.

Since about 2017, RUSSOFT recorded a noticeable increase in the interest of Russian custom software developers in the markets of Asia, the Middle East and Latin America. Even the African market started to attract Russian custom software developers, who also saw a solvent demand in this market for project development services. It turned out that this demand exists even in countries where the cost of labor is much lower than in Russia, since in these countries, as a rule, specialists do not possess the experience and qualifications required to implement complex projects.

The development strategy of service companies, which involves the development of new markets, led to the fact that during the survey conducted in

2022 44.5% of such companies indicated interest in the markets of South and East Asia, the Middle East, Latin America and Africa. The presence of interest means that they either already were operating in these markets in 2021, or planned to enter them in 2022. A year ago, there were fewer such companies – 39.5%, although then respondents could report plans not for one year (current in relation to the time of the survey), but for two years (current and next).

The attitude of Russian product and service companies to operations abroad (share of surveyed companies) in 2021-2022

	Service		Product	
	2021 survey	2022 survey	2021 survey	2022 survey
Work or plan to work this year in all markets	1%	3%	9.5%	2%
Did not operate abroad in the previous year and do not plan to operate abroad	16.5%	21.5%	17%	28%
Operations only in Russia in the previous year	23%	26%	27.5%	40%
Western markets (actual presence or plans to enter these markets)	65%	57%	57.5%	30%
New markets (actual presence or plans to enter these markets)	39.5%	44.5%	40.5%	34%

In 2021 12% of Russian service companies surveyed were present in the market of the South and Central America, and a year earlier there were only 3% of such companies. The share of operating service companies in the Middle East market grew from 8% to 18%, and in the African market – from 1% to 6%. The figure for India is not very large (4% with double growth in a year), but it is noteworthy that it is not zero. A few years ago, it was difficult to imagine that the services of Russian service companies would be in demand in the Indian market, with powerful local companies in India that dominate the global market for custom development and other IT services.

The interest in Western markets shown by the results of the survey conducted in 2022 is still high. This interest was indicated by 57% of surveyed service companies, but in 2021 the share of such companies was higher – 65%. The dynamics is such that the markets which are referred by RUSSOFT as "new" will soon be more often indicated by custom software developers as attractive if compared to the same indications of the markets of Western countries.

US and European politicians are forcing Russian software companies to faster reorient to the markets of Asia, the Middle East, Latin America and Africa. By the end of 2022, most likely, the markets of Western countries will still provide Russian outsourcing companies with the main export revenues, but by the end of 2023 they may cease to be the main source of foreign sales. At the same time, it is not unlikely that European and American enterprises hosting custom software development in Russia will be in greater loss than Russian software companies, which have previously created information systems for these enterprises and which have participated in complex design developments.

Presence of Russian product and service companies in the domestic and foreign markets in 2020-2021, % of surveyed companies

	Product		Service	
	2020	2021	2020	2021
Russia	100%	99%	98%	90%
Near abroad countries	64%	53%	32%	32%
Belarus	35%	35%	14%	9%
Ukraine	27%	16%	11%	6%
Kazakhstan	51%	36%	18%	21%
Uzbekistan	22%	24%	8%	6%
USA/Canada	21%	11%	43%	41%
Europe (without Russia and near abroad countries)	32%	27%	54%	46%
Great Britain	13%	7%	20%	12%
France	12%	8%	10%	10%
Italy	12%	3%	9%	6%
Germany and German-speaking countries	12%	10%	24%	22%
Northern Europe (Scandinavia and Finland)	10%	6%	14%	15%
Central and Eastern Europe	18%	10%	14%	21%
South and East Asia	25%	15%	18%	21%
China	12%	5%	7%	6%
Japan	5%	4%	2%	4%
India	13%	5%	2%	4%
Africa	16%	6%	1%	6%
South and Central America	16%	8%	3%	12%
Brazil	8%	5%	1%	4%
Mexico	8%	4%	1%	3%
Argentina	5%	2%	1%	6%
Middle East	17%	11%	8%	18%
Australia/New Zealand	9%	1%	7%	12%

Product companies more often have started their history with operations only in the Russian market. As a rule, these companies have very quickly launched sales also in near abroad countries and only after a while, after having generated free resources required for international marketing, they started to enter the markets of far abroad countries. In some cases, software products were straight away developed for the global market, but there are only several dozens of such successful cases. In addition, companies that immediately sought a global presence subsequently changed their jurisdiction or initially positioned themselves not as Russian business entities.

There are cases (at least one is known) when Russian software products were successfully sold only abroad, and only then they were launched in the Russian market with some difficulties.

Thus, the share of exporters among companies specializing in software development showed growth in recent 20 years. The results of questionnaire surveys conducted during the last two years show that such growth is followed by a fall. However, now this conclusion will be incorrect, since many exporters of software products could not take part in the survey conducted in 2022 (these exporters were engaged in urgent solving of problems that arose due to the sanctions policy of Western countries). The composition of surveyed product companies has changed a lot because of this situation. 34.4% of product companies of all companies participating in the survey did not have export revenues in 2021, while in 2022 the share of such companies became 50.5%. It was this change that led to a decrease in the percentage of domestic software developers "present in foreign markets". And notably the companies operating in the markets of Western countries were most affected by sanctions. It was more difficult for them to take part in the survey than for companies that operate only in Russia and in non-western markets. With no account for the change in the composition of surveyed companies, the indicators of product companies presence in various foreign markets would most likely be almost the same as a year earlier. For this reason it is better to judge the interest of these companies in various foreign markets based on the results of the survey conducted in 2021. It can only be assumed that product companies reorientation from the markets of Western countries to the Russian market and markets of near abroad countries, of Latin America, Africa, the Middle East and Asia, if not yet explicit in the last 2 years, will definitely start in 2022.

The structure of the array of surveyed service companies, which is determined by the share of export revenues in total revenues, is practically the same in 2021 and in 2022. That is why the conclusions about service companies reorientation from some markets to others are quite correct.

4.7. Geographical Distribution of Software Development Centers

Remote software development centers are created by Russian companies to solve two problems: either to ensure more close location of developers to the customer and so that they can work out with customers all the issues that arise 24/24 and 7/7, or (which happens more often) to gain access to local human resources in the labor market. Most often, Russian companies find the right specialists in other cities of Russia.

The results of the survey conducted in 2020 show, that in 2019 44% of surveyed companies had remote software development centers in other cities of Russia. But in this case, the results of the survey were affected by the coronavirus pandemic, due to which the composition of surveyed companies showed a more significant predominance of large companies located in Moscow and St. Petersburg than in other years. Herewith, the number of respondents was insufficient. The results of the survey conducted in 2020 only in rare cases can reveal any trends in the distribution of remote software development centers in Russia.

The data of the survey conducted in 2021 produced results that allow to better identify trends. For example, there are all reasons to believe that the share of companies that planned to open a development center in Russia or abroad in the next 2 years has grown (this also applies to far abroad countries). However, it was not clear how these plans would be affected by the practice of using the remote mode of operation for a significant part of employees outside the office.

Availability of software development centers and plans to open such centers in the next 2 years, share of surveyed companies

	Survey in 2016	Survey in 2017	Survey in 2018	Survey in 2019	Survey in 2020	Survey in 2021	Survey in 2022*
Have at least one remote development center in Russia or abroad	40%	43%	31%	32%	44%	37%	41%
Plan to open in Russia or abroad in the next 2 years	32%	25%	31%	31%	36%	38%	16%
Have abroad	22%	22%	16%	14%	28%	13%	8%
Plan to open abroad in the next 2 years	22%	11%	11%	17%	21%	20%	13%
Have in far abroad countries	11%	14%	11%	10%	24%	10%	6%
Plan to open in far abroad countries in the next 2 years	15%	9%	10%	14%	18%	17%	10%

* — plans not for the next 2 years, but only for one current (2022) year

The companies surveyed in 2021 assumed that the remote mode operation for the current year would account for 58% of man-hours. In 2022, this figure fell to 36%, which suggests that some employees were sent to the "remote" forcibly, while work in the office is more desirable for them.

The share of man-hours attributable to remote operation still remains significant, but the impact of this factor on the presence of development centers in other cities of Russia and in other countries cannot be determined based on the available data. A large share of surveyed companies still has a production site outside the city where the head office is located (41% in 2022). When adjusting the survey results with account for not entirely ideal representativeness, it is

possible to say that approximately 35% of Russian software companies have remote development centers, and that changes of this indicator, if any, are insignificant. This is the share of enterprises that need an additional production site, and that can afford to create such additional production site.

Reduction in the share of surveyed companies that have software development centers abroad or plan to open such centers abroad, is not related to real changes, but to the fact that, firstly, the survey involved a smaller number of enterprises actively working for export, and secondly, a change was made to the questionnaire according to which respondents in 2022 reported plans only for the current year, and not for 2 coming years, as was the case in previous surveys.

At the same time, despite the fact that the survey failed to cover the same number of exporters as in studies in previous years, interesting data were obtained on plans for 2022. Interest in countries in the former USSR has sharply increased (with the exception of Ukraine, which does not have and is not planned to open software development centers, as well as Belarus). Offices in these countries (for example, in Armenia, Georgia, Uzbekistan) are already open or will soon be opened, primarily in order to work with customers in the EU and the USA from these offices. Development centers in South and East Asia, as well as in the Middle East, may have the same function, but these macro-regions are also attractive as markets in which Russian software companies can significantly increase sales.

Attractiveness of macro-regions (countries) for operation of remote development centers in these regions, % of surveyed companies

	Plans to create a development center in 2022 (the survey conducted in 2021)	Development center already exists or is planned to be established in 2022 (the survey conducted in 2022)
Russia	4.1%	43.3%
Other former USSR countries (except for Belarus and Ukraine)	6.4%	8.2%
Belarus	0%	2.3%
Ukraine	0%	0%
Scandinavia and Finland	0%	0.6%
Germany and German-speaking countries	0.6%	1.2%
Central and Eastern Europe	2.3%	3.5%
Other Western European countries	1.8%	3.5%
Middle East	5.3%	5.3%
South and East Asia	3.5%	4.7%
USA/Canada	1.8%	4.1%
South and Central America	1.2%	1.2%
Australia	0%	0.6%
Africa	1.2%	1.2%

The changes in the questionnaire made in 2020 made it possible to obtain data on which cities of Russia are most interesting for remote development centers establishment and on the number of employees in these centers.

In 2021 many more cities were represented in the answers to this question than a year earlier, because the number of surveyed companies increased from 72 a year earlier to 206.

As a result, it turned out that the head office or remote software development centers are located in 66 cities of Russia, which cities represent 50 regions. It can be considered that the survey covered all cities and regions in which at least several dozen software companies operate.

In 2022 less software companies were surveyed – 171. This is why the number of cities and regions represented by

respondents has decreased: head offices or remote software development centers of Russian companies exist in 64 cities that represent 48 regions of Russia, as well as Kazakhstan and Belarus.

Head offices of surveyed companies are located in 36 settlements (29 regions), remote development centers are located in 53 cities (in 42 regions of Russia, in Kazakhstan and in the Republic of Belarus).

The total number of employees (technical specialized specialists) of remote development centers amounted to 4,412 people by the end of 2021. A year earlier, there were 11,396 people. The decrease was only due to the fact that several very large companies with a large number of employees and an extensive network of remote development centers did not participate in the survey conducted in 2022. In previous years these companies have almost always forwarded their completed questionnaires.

Although the quality of the survey in 2021 was much better than a year earlier, in terms of the number of employees in remote development centers, the first 4 positions are also occupied by St. Petersburg (again with a wide margin from others), Voronezh, Nizhny Novgorod and Saratov (while Nizhny Novgorod and Saratov have changed places, but their indicators are not very different).

In the survey conducted in 2022 Nizhny Novgorod rose to the first place based on this indicator, but only because some large companies that have remote development centers with a large staff in St. Petersburg did not participate in the survey.

Number of mentions of the city (region) as the place of location of the head office or the remote development center (Top-10)

1	Moscow	68
2	Saint-Petersburg	58
3	Novosibirsk	17
4	Rostov region (Rostov-on-Don)	15 (12)
5-6	Tomsk	11
5-6	Tatarstan (Kazan)	11 (7)
7-8	Nizhny Novgorod	10
7-8	Moscow region	10
9-10	Yekaterinburg	9
9-10	Crimea	9

Top 15 Russian cities by the number of employees in remote software development centers of non-resident companies located in these cities, people

	Survey in 2020			Survey in 2021			Survey in 2021	
1	Saint-Petersburg	3487	1	Saint-Petersburg	4318	1	Nizhny Novgorod	490
2	Voronezh	749	2	Voronezh	845	2	Saint-Petersburg	473
3	Saratov	728	3	Nizhny Novgorod	656	3	Moscow	455
4	Nizhny Novgorod	546	4	Saratov	621	4	Samara	440
5	Moscow	497	5	Samara	554	5	Voronezh	227
6	Omsk	480	6	Ryazan	521	6	Kazan	213
7	Ryazan	480	7	Omsk	415	7	Novosibirsk	207
8	Izhevsk	297	8	Perm	295	8	Krasnodar	206
9	Samara	297	9	Moscow	286	9	Orel	202
10	Kostroma	286	10	Izhevsk	278	10	Yekaterinburg	158
11	Novosibirsk	180	11	Yaroslavl	275	11	Rostov-on-Don	151
12	Tver	140	12	Cheboksary	240	12	Saransk	112
13	Taganrog	85	13	Rostov-on-Don	204	13	Minsk	99
14	Togliatti	80	14	Belgorod	143	14	Vladivostok	92
15	Rostov-on-Don	79	15	Tver	138	15	Tomsk	90

4.8. Facts Related to the Geographical Expansion of Russian Companies in 2017-2022

Over the past 6 years, the most news reports addressing the foreign activities of Russian high-tech companies has concerned South and East Asia. Also, judging by this news, the attractiveness of the market of former CIS and the Middle East countries is very high. The European market was very interesting, but only until 2022, so that at this yearend there will

probably be much more news reports on the problems of Russian IT companies in this market compared to the number of news reports on their successes.

Foreign marketing activities in 2020-2021 were negatively affected by the pandemic with its inherent restrictions on foreign events and trips.

Naturally, over 6 years, the major amount of news was related to the field of information security. Moreover, conclusion of any contracts in this area is advertised much less often than in other areas.

Statistics on news about activities abroad in the IT sphere in 2017-2022 with division by macro-regions

	2017	2018	2019	2020	2021	2022 (6 months)	Total news reports in 6 years
South and East Asia	7	4	13	8	3	3	34
Europe (without Russia and near abroad countries)	6	3 (1-)*	6	6	6 (2-)	1 (1-)	28 (4-)
Middle East	5	2	7	3	5	2	24
Near abroad countries	5	2	5	6	4	7	29
Africa	1	2	5	4	3	1	16
Latin America	4	1	1	2	2		10
USA	1	2		1	5 (2-)	3 (1-)	12 (3-)
Australia	1					1	1
Total in a year	22	16	31	24	29 (4-)	17 (2-)	

* — a minus in parentheses indicates the amount of news with negative character (for example, exit from the foreign market)

Statistics on the news on activities in the IT sphere outside Russia in 2017-2022 with division by areas of activities of developers

	2017	2018	2019	2020	2021	2022 (6 months)	Total news reports in 6 years
Information Security	6	4 (1-)*	6	5	3 (1-)	5 (2-)	29 (4-)
AI intellect, robotics	1	1	3	1	3	1	10
Enterprise management systems, billing	5		1	3	3	5 (1-)	16 (1-)
Biotmetry, identification systems, video surveillance	2	1	1	1	2	0	7
Data storage systems, Data backup and storage	2	2	0	0	2	0	6
Custom software development and IT services	1	1	3	0	0	0	5
Video conferencing	0	0	1	3	0	1	5
Systems for public administration	0	0	2	2	0	0	4
Data analysis solutions	2	0	1	0	0	1	3
Cloud management development	1	1	0	1	0	0	3
Office software	0	0	1	1	1	0 (1-)	3 (1-)
IoT	0	0	0	1	1	1	3
Electronic document flow	0	0	0	2	1	0	3
Online trading solutions	0	0	0	1	2	0	3
Other	1	1	5	3	1	1	12
Total areas covered	9	7	14	14	10	7	

* — the minus in parentheses indicates the amount of news with a negative character (for example, exit from the foreign market)

4.9. Vertical Markets

The frequency of mentions of vertical markets in 2007-2019 (% of all respondents)

Year of survey / Vertical markets	2007	2009	2011	2013	2015	2016	2017	2019	2020	2021	2022
Information Technology	89%	69%	74%	74%	68%	70%	80%	78%	79%	78%	72%
Banking *	35%	36%	23%	26%	34%	29%	20%	38%	53%	39%	45%
Telecom	34%	33%	26%	31%	27%	27%	30%	44%	46%	41%	35%
Industries	31%	31%	27%	38%	37%	33%	28%	41%	57%	51%	55%
Hospitality, Travel & Transportation	24%	31%	28%	29%	31%	27%	28%	45%	61%	42%	47%
Government	28%	25%	21%	24%	28%	24%	22%	37%	49%	38%	43%
Power supply, Gas & Oil	18%	24%	17%	22%	29%	21%	18%	32%	43%	41%	42%
Healthcare and Pharmaceuticals	23%	24%	23%	28%	28%	24%	26%	39%	53%	43%	38%
Retail & Distribution	35%	24%	26%	29%	24%	26%	22%	38%	50%	37%	36%
Education	36%	23%	21%	28%	24%	25%	22%	31%	39%	37%	36%
Science and Applied Research	—	—	18%	26%	20%	20%	26%	31%	35%	25%	18%
Gambling and Entertainment	20%	11%	9%	15%	17%	15%	16%	22%	14%	11%	8%
Media	—	—	13%	18%	18%	13%	14%	18%	21%	18%	12%
Sport and Travel	—	—	10%	17%	11%	15%	16%	23%	29%	19%	13%
Insurance	—	—	13%	15%	15%	13%	11%	21%	25%	24%	22%
Building and Real Estate	—	—	12%	17%	28%	17%	16%	33%	36%	33%	35%
Services	—	—	27%	35%	26%	22%	28%	42%	44%	36%	30%
Finances	—	—	25%	26%	21%	19%	19%	33%	47%	33%	33%
Energy	—	—	17%	21%	24%	22%	21%	31%	42%	35%	38%

* — till 2011 – Banking & Financial Services

For the entire duration of the survey performance by RUSSOFT no consistent pattern was revealed related to the change of the importance of individual vertical markets for Russian software development companies. Fluctuations of this indicator are random or temporary. In general, it can be concluded that industry-based priorities of Russian exporting companies have not fundamentally changed during a decade. The only clearly identified pattern related to vertical markets was due to a sharp reduction in the number of mentions of these markets per one company at a time of crisis. In 2009-2010 software developers were forced to concentrate their efforts in the areas in which these developers are most competitive, or in the areas less exposed to the global crisis. A similar decrease in this indicator was revealed during the survey performed in 2015-2016.

In 2018 no relevant question was present in the questionnaire. This question was again included in the questionnaire in 2019 and allowed us to see a sharp increase in the average number of these vertical markets – it reached 6.8, while in 2016-2017 this figure was 4.6.

The growth of this indicator continued in 2020 (an increase to 8.2), but this was primarily due to the specific composition of the surveyed companies (the share of small companies was much less than in previous years). Nevertheless, the data of the survey performed in 2021 suggests that since 2019 (perhaps since 2018, when there was no corresponding question in the questionnaire) the digitalization process has intensified in almost all sectors of the Russian economy, which intensification has affected the increase in demand in vertical markets. In the past three years, the frequency of mentions of each vertical market has also fluctuated, as in previous years, but already at a high level. The average number of specified vertical markets per company in the survey performed in 2021 was 6.8, the same as in 2019, with a slight decrease to 6.6 in 2022.

HUMAN RESOURCES

5

RECRUITMENT MARKET 2022—2023: MAIN CHALLENGES AND TRENDS

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The recruitment market in IT sector is nowadays in a state of continuous transformation. In spring 2022, companies focused on recruiting experienced specialists and reduced the recruitment of beginners and trainees. A significant number of employees had been released after the foreign companies exited the market. The custom development and testing segment, working mainly with open source software, feels now more confident, there is an active struggle for talents in a number of areas (information security, 1C development), but in general the situation remains hardly predictable.

What does the ideal portrait of a developer company look like and which HR tools come to the fore in the face of turbulence?

The main focus of employers should be taking care of the employees' well-being. Standard benefits, such as VHI and loyalty programs, become not just a sign of good form, but critical HR options. Here we can add psychological and legal support services, advanced insurance options (cancer insurance, life insurance), vaccination in the office, support in non-standard situations (for example, VHI and payments to families in case of employee's mobilization).

During periods of instability, it is difficult to overestimate the importance of a developed corporate culture and trusting communications. The company's task is to openly inform employees about internal and external events that may affect their lives and work, using operational communication channels for this. These can be direct lines, e-mail newsletters, social networks, and hot lines. Educational, entertainment and charity events help maintain an atmosphere of cohesion, partnership, and strengthen the morale of a team.

Modern development standards: a software environment, a problem-solving working infrastructure, transparent goal setting are perceived by job seekers as a "hygienic" level of work. Priority more often will be given to large companies with a reliable brand that can guarantee stable employment, a variety of tasks, the use of sought-after technologies and programming languages.

In recent years, the attitude of employees to office space and working hours has changed dramatically. Developers prefer to choose between working at home and in office, or at least have a hybrid pattern option. This is especially true for large cities, where the way to and from the office can take more than 3 hours a day.

It is important to understand that recruitment in the IT industry does not stop completely even during periods of instability. With the strengthening of the course on technological independence, IT professions will remain among the most in-demand on the market. Attracting and retaining talented specialists will always be an urgent task of business, therefore, the contribution to the development of HR tools today will bring significant dividends to companies tomorrow.

5.1. Assessment of the General Situation with Human Resources Availability in the Software Industry

It was stated in all the reports on the results of the study presented in the beginning of this chapter how many software development specialists have worked in Russia at the end of the previous year and what was the increase of this indicator compared to the previous year (both in the industry as a whole and in certain categories of companies). It was always assumed that every year the number of programmers is increasing by another few percent.

Information about the number of IT specialists and on the growth of this number was the main one in the chapter on human resources. In 2022, one of the key sections was the section on the brain drain with the personnel moving abroad, which brain drain in the previous 10–15 years posed a problem affecting a not very wide range of companies.

After the start of a special military operation in Ukraine, this circle has expanded — the software industry lost up to 13 thousand specialists during the first half of 2022, and with account for the departure of all software developers, including those working in other industries, possible losses can amount to about 20 thousand people. Given the annual number of graduates from universities in IT specialties, the growth of the total staff of Russian software enterprises for this year is likely to be positive, but it will be much less significant than in the last few years.

As a result, data on the number of the personnel in the industry at the end of the previous year become less relevant due to a large-scale drain of the personnel in the first months after the start of a special military operation, but these data are still important in order to track changes occurring over a period significantly exceeding several months.

There were at least 720 thousand employees in Russia at the end of 2021 directly involved in the software development process (in software companies such specialists are considered to be profile-specific experts). The increase in their number for the year amounted to about 12%, as in 2020. In 2018–2019 this figure was at the same level, but was slightly lower — 10–11%, while over the previous few years (through 2017 inclusive) this indicator was stable at around 6–8%. It follows that in 2020 the industry added at least 80 thousand software developers. A significant part of the increase (about 40%) was provided by universities.

This is a conservative assessment. It is also required to account for a serious error in the available calculations conducted based on the survey of software companies. As for the assessment of the number of software developers employed in other sectors of the economy and social sphere, and also in the public sector, it is assumed that they account for about ¾ of all specialists, and this share does not change significantly from year to year. This assumption must be checked annually, but to do this it is desirable to conduct an additional research on human resources and training in the field of software development, which is significantly larger than the area of the software industry studied by RUSSOFT.

When restricted to data only for Russian software companies, it turns out that at the end of 2021 at least 225 thousand profile-specific technical employees worked in these companies. Calculations

Lately, many foreign IT companies have closed their businesses in Russia, which has put the labor market in motion and has rectified the accelerating trend towards the "candidate-driven market". However, despite forecasts, there has been no mass relocation of IT professionals. Under these circumstances, a key task of HR business partners has become to consult engineering managers on resolving non-standard employees' issues and maintaining a favourable atmosphere in a team. This is what has enabled Auriga to increase the level of expertise and motivation in project teams.

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are made based on the data of the survey in which respondents were asked to indicate the number of such employees of their companies (indicating the change in numbers over the year). At the same time, at least 10 thousand of specialists are located outside the country, working in the development centers of these companies abroad. It follows that about 215 thousand persons worked directly in software companies in Russia at the end of 2021, which is 12% more than at the end of 2020.

Calculations show that this 12% growth in the number of profile-specific specialists has occurred both throughout the industry and in the companies surveyed.

Since the error of the results of the calculation conducted based on the data of the survey is quite large, it is better to focus on some conservative estimates. Nevertheless, with account for other indirect data an increase in the growth rate of the staff of the Russian software

development industry can be stated with certainty.

Over the past 4 years, both large and small software companies have steadily increased their staff by at least 8% per year. According to the results of 2021, the increase amounted to 11.6% for companies with up to RUB 375 million turnover and 9.5% for companies with more than RUB 375 million turnover. This data apply only to the companies surveyed. If these figures are extrapolated to the total industry, the average growth in companies with more than RUB 375 million turnover is 12.8%.

Before 2017, the growth of large companies was faster, largely due to the inflow of personnel from smaller companies.

The increase in the growth rate of the total number of personnel can also be explained by the fact that, thanks to the activity of the APKIT Association, starting

in 2014, the number of quotas for state-financed openings in IT specialties in the universities started to grow. It is unlikely that the number of state-financed openings in IT specialties has increased by 70% in three years, as was announced in the media, but it can definitely be said that there are 20–30% more of them. The number of admitted students in IT specialties was mainly increased in regional universities (the leading universities in Moscow and St. Petersburg did not see the opportunity to admit more students with no reduction of their average training level, since a significant increase in the output of qualified programmers requires initial investment in teachers training).

In 2021, the number of staff decreased in 11% of surveyed companies, did not change — in 29%, and increased — in 60%. The increase in numbers by more than 10% was noted in 40% of companies, by more than 30% — in 14%, by more than 50% — in 6%.

Total number of profile-specific specialists

	end of 2016	end of 2017	end of 2018	end of 2019	end of 2020	end of 2021
Software developers working in Russia in all industries (including IT services), thousand people	470-480	>500	>540	>580	>640	>720
In the Russian software industry (without employees in centers located abroad), thousand people	132-137	>140	>155	>170	>190	>215
Employees distribution by business model						
in service companies (including works for foreign customers)	56–57% (≈22%)	≈58% (≈22%)	≈59% (≈22%)	≈54% (≈23%)*	≈55% (≈23%)	55.8% (≈23%)
in product companies	≈40%	≈38%	≈37%	≈41%*	≈40%	≈39.4%
in Russian R&D centers of foreign companies	≈3–3.5%	≈4%*	≈4%	≈5%*	≈5%	≈4.8%

* — the change in this indicator does not reflect growth, but the adjustment made upon the receipt of additional information (in 2019, a significant adjustment was made due to the sale of a number of large companies that no longer were considered to be Russian, and also due to the use of an updated calculation method).

5.1.1. Staff Rotation

The personnel turnover rate has been fluctuating through 2015 mainly in the range of 6–7%, but in 2016 it has increased to 9.5% and in the next two years has stabilized at this level. There was a new jump in 2019 — up to 12.5%. Given that in 2020 an insufficient number of companies participated in the survey, there were doubts about the accuracy of the value obtained. However, the data obtained during the survey conducted in 2021 showed that such a jump did occur: at the end of 2020, the personnel turnover rate was 13.3%. The increase in this indicator is confirmed by other sources.

The results of 2021 indicate the stabilization of the personnel turnover process at the level approximately 12–13%. The average personnel turnover rate for the companies surveyed was 9.7%, but if you delete the data of one large company, this figure will be 13.3%. For companies with turnovers from RUB 75 million (USD 1 million) to RUB 7.5 billion (USD 100 million) this indicator was never below 12%. The number of the companies surveyed with more than USD 100 million turnover is too small to extrapolate to all such companies in the industry. Data on the companies with less than USD 1 million turnover are almost

always less than 10% with some jumps caused, apparently, by random factors. Herewith, it can be considered that the average indicator for the entire industry is not less than 12%. It follows that, compared to the previous year, in 2021 there was a decrease in the personnel turnover rate, but a very small one.

In previous years, at least half of the surveyed companies have faced annual layoffs (in 2016 — 59%, in 2017 — 50%, in 2018 — 58%, in 2019 — 67%). At the end of 2020, 96% of the companies that answered the corresponding question have faced personnel losses. However,

Annual personnel turnover rate by company size

year	For all companies surveyed	more than USD 100 million*	from USD 20 million to USD 100 million	from USD 5 million to USD 20 million	from USD 1 million to USD 5 million**	less than USD 1 million***
2012	6.0%	4.6%	8.3%	9.0%	8.4%	4.8%
2013	6.0%	7.7%	7.4%	7.8%	8.2%	13.1%
2014	7.7%	5%	6.5%	7.4%	6.6%	7.7%
2015	5.7%	6%	6.1%	8.1%	6.1%	6.2%
2016	9.5%	11%	6.7%	10.9%	6.2%	6.5%
2017	9.5%	9%	8.8%	16%	5.4%	6.6%
2018	9.3%	2%	13.8%	10.8%	9.7%	6.7%
2019	12.5%	12.6%	9.9%	17.5%	12.3%	8.5%
2020	13.3%	17.4%	7.1%	12.9%	13.3%	18.6%
2021	9.7%	5.22%	12.63%	13.10%	12.08%	8.0%

* — as a rule, several companies, and in 2016 and 2018 only one and two, respectively.
** — through 2014 inclusive "from USD 0.5 million to USD 5 million."
*** — through 2014 inclusive "less than USD 0.5 million."
**** — in 2019–2020, due to the translation of calculations into rubles, the intervals were translated at the exchange rate of RUB 64 per USD (in 2021 — RUB 75 per USD).

more than half of the companies participating in the survey (54%) have chosen the "I find it difficult to answer" option. It is difficult to assume the reasons for such a massive refusal to answer this question (a year earlier there were only 28% who did not want to answer the question on the "personnel turnover"). Apparently, this question has become especially painful for companies

or it is already difficult for them to keep track of how many employees have quit the job during the previous year (it is easier to answer the question when there are no layoffs).

When summing up the results of 2021, only 9% of the companies surveyed found it difficult to answer the question on how many employees have quit

the job during the year. 69% of the companies that answered this question had layoffs.

In the current conditions, when the staff is annually renewed by more than 10%, companies have to learn to start projects with one team, and finish them with a completely different one.

5.1.2. Sources of Staff Replenishment

There are three main sources of staff replenishment for software companies: university graduates, foreign specialists (primarily from neighboring countries) and employees of enterprises of other industries with engineering education. Basically, there was only one important source of staff replenishment until 2019 — universities. Until 2016 in some years the migration of software developers

from Kazakhstan, Ukraine and Belarus has provided up to 20% of the increase in the total staff of Russian software companies (not counting employees of foreign development centers of these companies), but in 2017–2018 this figure did not exceed 5%.

In 2021 a new question appeared in the questionnaire allowing to determine

the significance of all the main sources of staff replenishment of personnel in software companies. This question allowed to abandon two older questions — on the share of specialists who have moved to Russia, and on the share of university graduates among the new employees. As a result, it became possible to obtain the unique and completely new information.

Distribution of the increase in the number of profile-specific technical staff of software companies obtained at year-end 2020 by sources of staff replenishment

	according to the results of 2020	according to the results of 2021	less than RUB 375 million turnover	more than RUB 375 million turnover
expert graduates of Russian universities and specialized colleges	28.6%	28.1%	39.1%	27.6%
students of Russian universities and colleges that combine work and study	50.7%	10.8%	35.7%	9.6%
experienced software development specialists who have joined your company from a not software company	8.3%	28.9%	16.1%	29.6%
software development specialists who have moved to Russia temporarily or for permanent residence from other countries	4.9%	1.3%	1.0%	1.3%
specialists who have been trained as software developers under retraining programs	2.0%	8.7%	5.7%	8.8%
other source (e.g. self-taught persons with no special education)	5.5%	22.2%	2.4%	23.2%

It is possible that the share of students combining work and study differs in reality by 5 or even 10 percentage points, but these students prevail in the additional number of employees that appeared during 2020. University graduates ranked second. Jointly they represent one source of staff — higher education institutions. In 2020, they provided almost 80% of the growth in the total staff of Russian software companies.

Despite the pandemic and difficulties in crossing borders, almost 5% of the increase in IT staff is accounted for by the migration of specialists (primarily from neighboring countries).

A little more than 8% are is accounted for specialists who have taken jobs with software companies from IT departments of enterprises in other industries. However, it is difficult to consider this source of staff as a full-fledged one, since the flow of personnel moving in the other direction is not known. It can be assumed that this source, at least, is no less than the outflow of specialists to other industries. The same applies to migration, but in 2020 moving to the West was difficult due to the pandemic (the United States temporarily refused to attract IT specialists from abroad). For this reason the balance of software developers arrival to/departure from Russia most likely was positive. It is desirable to determine this balance with division by intersectoral transfers and interstate migration of specialists, but it is not yet possible to track new places of employment of those employees who have quit the job in the company.

In 2021 the survey revealed significant changes in headcount growth that are unlikely during the year. First of all, the share of students who combine work and study has sharply decreased. For this reason the contribution of universities (students and graduates) to

software companies staff replenishment has decreased from 80% to 40%. The growth rate of the number of staff due to university graduates is almost the same as in 2020 (slightly over 28%). This growth should be stable.

At the same time, the inflow of personnel from other industries has increased (from 8.3% to 28.9%), as well as the share of specialists trained as software developers under retraining programs (from 2% to almost 9%). Other sources of personnel started to provide for 22% of the total staff increase, while a year earlier these sources have provided for only 5.5%.

An increase in the contribution of retraining programs has confirmed itself as a significant source of staff replenishment among all the rest major sources. Indeed, in recent years, the activity of educational institutions engaged in retraining has increased sharply. Due to the pandemic, online courses have become more actively used, which make training available to a wider range of people who want to become software developers. The availability of courses has grown both in cost and in learning opportunities available for residents of cities with no high-standard training centers. Such centers are located mainly in the largest cities (primarily in Moscow and St. Petersburg).

The question of the categorization of staff increases is relatively new in the annual study, and for this reason no data allowing to identify random fluctuations and to determine the error of calculations made on the basis of the answers received have not yet been accumulated. However, it can be assumed that graduates of universities and secondary specialized educational institutions provide approximately 28–29% of the total staff of specialists of enterprises specializing in software development. The contribution of retraining may well be increased. An

increased inflow of personnel from other industries is also possible, but the grounds for such an inflow are still unclear. It is not clear why, judging by the survey data, the students much less common do combine work and study.

Perhaps the survey results were influenced by a change in the structure of the array of surveyed companies (first of all, the share of companies with more than a half of revenues generated by exports has decreased). Among other things, the opinion expressed by the respondents could be influenced by the situation of the first months after the start of a special military operation in Ukraine, since their emotional mood, which always influenced the answers, has changed significantly compared to 2021.

These differences can be understood if we analyze the distribution of the contribution of all sources of staff replenishment in companies of different sizes. Smaller companies (with less than RUB 375 million turnover) are more actively recruiting specialists with no work experience (students and graduates of educational institutions). Companies with more than RUB 375 million turnover prefer to recruit specialists with work experience (and they have the opportunity for this). A higher proportion of new employees who have received retraining has good reasons, since many large and medium-sized companies have their own training centers in which they train specialists for themselves.

All the changes analyzed above relate only to the inflow of personnel into the software industry and do not account for intra-industry transfers. According to the results of 2021, intra-industry transfers account for 62% of all filled vacancies. In 2020 this figure was much less — 32%.

In any case, universities still remain the main source of staff replenishment in

software companies. The inflow coming from other industries is due to the staff replenishment in place in these industries sourced from higher education institutions. The entry of specialists from abroad, retraining of personnel along with other sources of personnel so far give much less than half of the number of new employees joining the Russian software industry over the year. For this reason it is especially important to understand how many specialists in the field of software development are trained by Russian universities.

At the end of November 2021, Deputy Prime Minister Dmitry Chernyshenko has stated that more than 80 thousand people have joined higher education programs in the field of information technology at the expense of the federal budget. 97 thousand Russian school students will be trained under secondary education programs related to artificial intelligence. At the same time, based on the instructions of the Russian President Vladimir Putin the number of state-financed openings in Russian universities in specialties related

to the development of artificial intelligence was increased by 7 thousand.

In December 2022, it became known that RUB 27.8 billion will be allocated from the state budget of the Russian Federation for the development of the potential of the personnel in the IT industry in Russia for the period from 2022 to 2024. The project for the development of IT personnel involves three areas giving consideration to the work with school students, university students and graduates.

The issue of paying the for second higher education in IT areas from the budget is being currently considered to attract personnel into the IT-sphere. The proposals were prepared following a meeting held in July 2022 on the topic "Scientific and Educational Policy and Training in the Digital Economy," chaired by Deputy Prime Minister Dmitry Chernyshenko and the First Vice Speaker of the Federation Council Andrei Turchak.

The demographic situation is difficult enough for an increase in the number

of state-financed openings to lead to a real increase in the number of students able to receive full-fledged education in IT specialties. Some universities cannot recruit the number of students allowed by state-financing. The problem is that the number of young people in 2013–2020 has decreased due to the demographic pitfall in Russia. At the same time, the popularity of IT specialties is very high.

According to a study conducted by the Russian School of Online Education in the field of GameDev XYZ School and by the Research Me analytical agency in the fall 2021, 51% of Russians want their children to work in IT.

According to a survey conducted by the Ministry of Digital Sciences of Russia and the "University of 2035" autonomous non-profit organization, 67% of parents of school students associate their future with the IT sphere. This survey was conducted among parents of grades 7–11 students, and its results were announced in January 2022.

5.1.3. Productivity Growth

In 2017 the total number of employees of Russian software companies has increased by 7%, and the total turnover in dollars has increased by 19%. In 2018 the difference was less — 7.8% and 10.6%, respectively. The decrease has occurred due to the depreciation of the ruble against the dollar.

Nevertheless, if the productivity is measured in dollars, a clear growth of productivity can be noted. The productivity of software developers has increased mainly due to the increase in the cost of services provided by software developers and due to the scaling of

the business of replicated solutions developers.

At the end of 2018, one profile-specific employee generated USD 75 thousand of revenues (foreign development centers included), while at the end of 2019 this figure was USD 96 thousand. At the same time, it is necessary to account for the fact that the composition of companies of respondents surveyed in 2019 and 2020 very different, and this makes correct comparisons difficult.

At the end of 2020, the total number of employees has increased above the

turnover increase in dollar terms (by 12% and 4.5%, respectively). It follows that the revenue per the profile-specific technical employee has decreased to USD 91 thousand.

In 2021 the average annual dollar exchange rate almost did not change compared to the same indicator in 2020. Since the total turnover of software companies has increased more than their headcount, it means that productivity has increased by 4% in dollars and by 6.3% in rubles. Income per one specialist amounted to USD 94 thousand (RUB 6.9 million).

5.2. Existing Need for IT-Specialists

It is largely senseless to try to quantify the overall shortage of software development specialists. Any of the statements on the deficit of programmers of 500 thousand people, 1 million people or 2 million people will be true. With account for the global manpower shortage and for the small share of Russia in the global software market (including custom development services), the domestic software industry can grow 2–3 times or even more due to a sharp increase in exports. For this reason it seems more correct to focus on the determination of ways to make the most of all the opportunities for personnel training and attracting — who can deliver training in Russia, who and how many persons can be trained in Russia and or who can be attracted from abroad. Quantitative benchmarks for the number of software developers will still be required, but for the optimum distribution of available resources required for training.

In any case, it would be useful to audit all available educational resources (both public and commercial) and all human resources with an analysis of the possibilities for their more effective use. Without no such audit any planning for specialist training would be carried out almost blindly.

When considering the current need for an additional number of employees required by the software company during one year, this need can be estimated more accurately than the total shortage for 10–15 years. Judging by the recruitment plans announced by the companies, on average they annually need additional 15–20% of their existing staff of profile-specific specialists annually. It is this amount the companies are ready to hire during the year.

Across the industry this deficit amounted in 2020 to 28–38 thousand people. In fact, in 2020 the companies hired much less people — about 20 thousand. Consequently, the shortage of IT specialists only in the software industry in the short term is about 10–20 thousand people. Almost 4 times as many programmers work in the entire economy. However, this does not mean that the staffing shortage for the entire software industry is 4 times higher. It can be assumed that the total annual unsatisfied requirement in software developers is 25–40 thousand people. That is, such a number of specialists would need to be additionally attracted to meet the needs of the industry.

Opportunities to solve the staffing problem:

1. Russian universities.

The higher education system can significantly increase the number of trained specialists if at least the same number of the same level universities is added to 20–30 leading universities existing today. Even the best universities have something to progress in (according to some surveyed employers, not all departments provide the same high quality of training).

(For more information on the potential for training at universities, see section 5.5. of this chapter.)

2. Specialized secondary education system.

Until recently, technical schools and colleges were not considered by employers in the software industry as a source of personnel, although the need for solid mid-level specialists was very high. The specialized secondary education system provides for quite mass training in IT specialties, but this system graduates only specialists that at best can be employed only as system administrators at small enterprises that do not use complex information systems. But in recent years, during the survey conducted by RUSSOFT, the heads of IT companies in a number of regions started to indicate vocational education institutions as the sources for staff replenishment.

3. Migration.

In the current situation one can hardly expect a large inflow of personnel from abroad. Nevertheless, the possibilities of attracting foreigners and the citizens of the former USSR to Russia must be studied. Of course, if specialists abroad are satisfied with everything they have, it will be difficult to persuade them to change their place of residence. However, dissatisfaction with work and life in other countries is gradually growing, which is facilitated by the anti-Russian prejudice and multi-gender policies, openly promoted in unfriendly countries. Obviously, in the conditions of the information war, not all foreigners know what conditions for life and work are available in Russia. The most important vacancies in the field of management and organization of foreign sales can be filled with the foreigners from economically developed countries. There are already examples of such vacancies filling, although these cases are rather isolated (see section 5.3 for details).

4. Teaching girls.

Software development was previously considered exclusively a male specialty. However, in recent years, this idea has been changing not only abroad, but also in Russia. With the involvement of girls in software development, it is possible to partially neutralize the negative impact of the demographic pitfall in Russia due to the difficult economic situation in the 90s.

According to a survey conducted by GeekBrains (its results were presented in March 2022), every second (56.3%) woman today wants to master a new profession. Housewives (62%), job seekers (61.6%) and pensioners (38.2%), as well as employed (59.9%), and self-employed (53.4%) respondents are interested in obtaining a new specialty in IT, design and marketing. At the same time, more than half (57.1%) of women wishing to find a job prefer a remote format of work (239,141 women participated in the survey).

In spring 2022, Kaspersky Lab conducted a study on how IT careers of women are developing in Russia today. It was found out that the main incentive for work and development in the industry is a high level of wages and bonuses. This answer was indicated by 56% of people participating in the survey, and the financial factor is more important for the age category 18–35 years (64%), while in the category 36–55 years it plays a key role for 43% of respondents.

The very fact of such a survey conduct by one of the largest software companies in Russia, aimed at expanding the staff, suggests that attracting women to the industry can help solve the problem of staff shortages.

5. Employees retraining (postgraduate education).

The huge potential for growth in the number of IT personnel is laid in the retraining of persons with higher education in specialties that are not IT. At the same time these are not necessary the holders of diplomas in technical specialties who have received good basic mathematical training. Biologists, doctors, chemists, linguists and many others are required. Their knowledge is needed to create specialized software

for various industries and purposes. What a biologist needs to know is better known by someone with relevant experience in biology. It is easier to teach programming than to master biology for a programmer (although this also has to be done sometimes). At the same time, the heads of software companies are ready to hire even mature (50–60 years) specialists who have received retraining.

In spring 2022, The Wall Street Journal reported that the US IT industry was flooded by employees with no university degrees. Companies prefer to hire such people and train them on their own to avoid a shortage of specialists and to maintain high growth rates. Large IT companies, including such big-name ones as IBM, have ceased to require university diplomas from employees. Russian analysts are confident that this is also due to the lower quality of modern higher education.

6. Disabled persons.

According to Gartner forecasts, by 2023 the development of artificial intelligence, virtual and augmented reality technologies will lead to a threefold increase in the number of employed people with disabilities. New technologies remove barriers that have previously hindered the involvement of such employees in the workflow. According to experts, hiring people with disabilities will help, businesses to solve the problem of shortages of qualified personnel. On the other hand, in such companies the employee retention rate is 89% higher and staff productivity increases by 72%, which leads to a 29% increase in profits.

In Russia no publicly available news reports were found on the training programs for people with disabilities for the needs of the IT industry.

Since the beginning of spring 2022, the IT personnel market has undergone a number of transformations. Foreign companies that left Russia have released thousands of specialists. Relocation ceases to be a trend. Many developers have returned, the reasons for this are: the language and cultural barrier, comfortable living, patriotic position. In March, the dollar renewed its maximum, so many programmers converted their salaries into foreign currency. Now the situation is reversed, so employees are returning to ruble equivalents. The interest of jobseekers in our country is growing.

Artem Gavrishin,
CEO at Simtech Development

simtech
DEVELOPMENT

In May 2022, it became known that NtechLab, MVS Group and MTS AI agreed to hire employees with autism spectrum disorders. They will also consider to introduce an up to 2% quota for such workers. An NtechLab spokesperson told CNews that the company believes the business's reluctance to promote inclusion presents a dubious decision.

7. Automation of programming.

Discussions about programmers' replacement with robots in some distant future are conducted already for many years. However, until recently this possibility was not considered to pose a real threat of loss of work for software developers.

According to a survey of the SuperJob portal conducted among the most common professions in summer 2020, it were programmers, architects and nurses who were least sure of the need to completely or partially change their job in the next 10 years. Nevertheless, 31% of those surveyed on the software developer portal still saw such a prospect.

In mid-June 2021, Gartner published a new report, according to which by 2024 80% of technology products and services will be created by non-professionals. This trend is due to the emergence of a new category of non-traditional IT customers, who usually hold a large share of the entire IT market.

Gartner also projected that by 2025 70% of new corporate enterprise-grade applications will be developed using low-code/no-code technologies, up from less than 25% in 2020.

In February 2022, it became known that the DeepMind startup forming a part of the Alphabet holding (directly related to Google) launched the AlphaCode neural network, capable of writing programs from scratch with only one description of the task. The project is at an early stage of development, but in its capabilities it already bypasses the entry-level and even more experienced programmers. The creators are confident that in the future AlphaCode will fully automate the process of codes generation.

Making the medical profile of the team makes it possible to one to adapt the insurer's VMI program to the real employees' needs. The platform based on DSS is used for coordinating doctor's appointments with an insurance company and improves the quality of treatment of the insured, the quickness of their service, the efficiency of spending money. Also, it reduces the losses of clinics from unpaid treatment bills. "Medical Arbitration" simplifies the work of HR with employees' complaints about refusals from the insurers, involves expert doctors from clinics for further consideration and coordination with the IC.

Yuriy Volkov
CEO "SOPOS"

SOPOS

5.3. Workforce Migration

Starting from the beginning of 2015, in connection with the events in Ukraine, an additional migration flow from the east of this country has made appearance in Russia. In 2016–2017 the inflow of the personnel from Ukraine and from neighboring countries has decreased slightly. In any case, the share of respondents reporting the admission of new employees arriving from other countries has decreased. At the same time, the outflow of programmers from Russia has not changed significantly, or rather has slightly increased. Judging by the fact that the increase in the number of personnel of the companies surveyed has consisted with the number of hired university graduates, it is possible to make the conclusion that migration flows have leveled off again — the number of specialists leaving the country is equal to the number of specialists entering the country. At the same time, there was also an inflow from the countries with a high level of wages, since some Russians travel abroad with plans to return after the termination of the signed contract.

It was not possible to correctly assess migration flows based on the results of 2019 due to the inability to conduct a full-fledged survey of software companies in spring 2020.

In 2021 this survey was successful. It showed that over the past year about 3 thousand specialists with invitations received from Russian software companies have entered the country. The same mass travel abroad (to Western countries) was impossible due to strict restrictive measures. In addition, the United States temporarily suspended the issuance of work visas to IT specialists.

The data of the survey conducted in 2022 indicate that the inflow of the personnel from abroad has decreased significantly.

It is quite possible that the reduction of this inflow is significant, but is not that great. The technique used implies a particularly large error in measuring small shares (several percent of the number of all new employees). Unfortunately, there is no way to accurately determine migration flows. It is fair to say that 1–3 thousand foreign specialists move to Russia annually. About the same number leaves the country, but this estimate was more or less reliable before the start of a special military operation. In previous years there was also a temporary increase in migration flows after certain events. For example, a sharp increase in software developers wishing to move to Russia from neighboring countries (from Ukraine) was observed in 2015, which fact is confirmed by data received from recruiting agencies. In the first half of 2022, there was a multiple increase in the outflow of personnel abroad.

5.3.1. Departure Abroad

Due to the increase in the outflow of personnel abroad in 2015, questions were included in the questionnaire during the survey conducted 2016 survey that allow to determine the impact of migration flows on the software industry. As a result, it turned out that the migration of employees abroad was a problem for 14% of the companies surveyed. This figure has increased to 17–18% in the later years. At the end of 2019 it could not be accurately determined due to the specifics of the survey during the pandemic, and at the end of 2020 it amounted to 27%.

However, we cannot say that there has been such a large increase in the departure of programmers abroad, since the wording of the corresponding question has changed. In the earlier years respondents have simply indicated the presence of a problem, but in the survey conducted in 2021 they were able to choose the form in which this problem does exist ("The problem has a quite massive scale in our company" or "We lose specialists in isolated cases, but these are key specialists"). Presumably, in the earlier years at least half of the companies indicating the presence of the problem believed mentioning this problem is justified only when the outflow of specialists abroad has a quite massive scale.

In 2022 it became possible to fully compare the results of answers to the question in a new wording (with account for the fact that the data of 2020 have a too large error due to the small number of companies surveyed during the lockdown at the very beginning of the pandemic). It turned out that in 2022 there was no increase in the share of companies for which the migration of employees abroad posed a problem.

On the contrary, the percentage of companies that have chosen the answer "There is no problem for our company" increased slightly from 66% in 2021 to 77% in 2022.

However, in some companies, this migration has a quite massive scale. For example, the respondent has chosen the answer "There is no problem for our company" in the condition of the expected loss of almost half of the headcount. In fact, it turned out that a significant share of employees will be fired and will begin to work abroad, but these employees are registered in those foreign legal entities that were created by the owners of this Russian company. It follows that formally the outflow is significant, but in fact the company does not lose anything. Losses are likely to be for the budget of the Russian Federation.

Distribution of answers of surveyed companies to the question on the migration of employees abroad
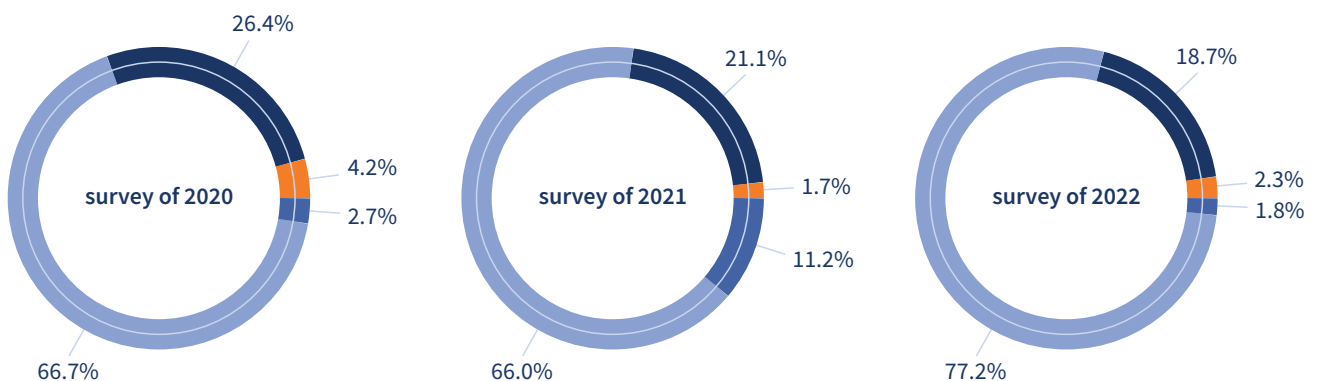
- The problem has a quite massive scale in our company
- We lose specialists in isolated cases, but these are key specialists
- There is no problem for our company
- "I find it difficult to answer" option

Nevertheless, the problem of "brain drain" is quite serious. The departure of IT specialists from Russian companies is quite massive, but it concerns primarily those employees who worked in companies that have completely stopped their operation in Russia. They are few, but these are large companies or development centers of foreign corporations that have organized a planned relocation of their employees.

The following forecast was formed in early June: Russian software companies may lose a total of 9–13 thousand profile-specific specialists in the first half of 2022 due to their travel abroad. If you add software developers employed in enterprises of other industries and government agencies, this indicator will increase to a maximum of 20.5 thousand. Losses for all IT specialists cannot exceed 40 thousand people.

Such estimates are made due to the collection and processing of a large array of information. In the first instance, the results of the survey conducted this spring as part of an annual study of the Russian software industry (it was conducted during the period from the end of February to May 31, 2022) were collected by RUSSOFT. In connection with the events in Ukraine and the US reaction to them, questions were added to the questionnaire about the expectations related to the outflow of personnel with their departure abroad, related to the change in the number of employees and turnover in the first half of 2022.

The sample was more than sufficient — 162 fully completed questionnaires. The results of calculations were changing only slightly with an increase in the number of surveyed companies changed slightly after receiving the first 20 questionnaires. Many years of research experience also suggest that 150–160 survey participants are quite enough to obtain industry indicators with an acceptable error.

The only problem is that the survey did not include companies that publicly announced the termination of all operations in Russia. But insider information was collected for these companies, which information was analyzed separately.

Judging only by the companies surveyed, the expected personnel losses are 1.5% of the total headcount. Companies with a service business model and a high share of exports suffer the most. Companies that receive more than half of their revenues from operations in foreign markets may lose almost 7% of profile-specific specialists, but this figure is only 0.5% in case the company has no export revenues at all.

Given all the difficulties and problems, the total headcount of the companies surveyed will increase by 5.5% in the first half of 2022, and the total turnover in ruble terms (compared to the same period in 2021) will increase by 24.1%. For companies no export revenues in 2021 this growth will be 9.8% and 34.9%, respectively.

According to the existing expectations, with more than 50% share of exports in the turnover, the staff will be reduced by 1%, and the turnover will increase by 22.7%. Such an increase in turnover with a reduction in staff, apparently, is associated with the assumption of a significant devaluation of the ruble (all questionnaires were obtained before strengthening of the ruble against the dollar and the euro).

Nevertheless, such forecasts indicate quite a dynamic development, but not any crisis in the software industry.

The situation will look a little different, given the data of companies that have announced the termination of their operations in Russia. This is especially true for the migration of employees abroad.

For such companies (with foreign owners, with head offices located abroad, with main revenues received from operations in the markets of Western countries) the information was provided by former employees, managers and also by recruiting agencies. It turned out that 30–40% of Russian employees agreed to the relocation in these companies, and they have already started to move en masse. About 20–30% are in thought, but did not give any consent, and the rest decided to stay.

For a month (from mid-April to mid-May) in St. Petersburg alone, a little more than 1.5 thousand specialists with work experience in those foreign companies which have announced their departure

The expected share of employees who may quit their jobs (including those who have already quit) in order to travel abroad in the first half of 2022

All companies surveyed	1.5%
Business Model	
Service model (custom development and services to parent companies of development centers of foreign companies)	4.5%
Product Model	0.4%
Turnover in 2021	
Less than RUB 375 million	2.2%
More than RUB 375 million	1.3%
Availability of export revenues in 2021	
There were no export revenues	0.5%
There were export revenues	3.1%
Share of export revenues less than 50%	1.7%
Share of export revenues more than 50%	6.9%

from Russia posted their resumes or updated them. Although more than half of them (54%) allow for the possibility of relocation (not necessarily to move abroad), they have demonstrated their willingness to stay. These data were provided by the press service of the hh.ru in the Northwest Federal District.

The total number of profile-specific employees of companies that have made the decision to stop software development in Russia maximum amounts to 25 thousand people. Consequently, with the successful relocation plans implementation personnel losses will amount to 10 thousand specialists. In total, 210 thousand profile-specific technical specialists worked in the Russian software industry at the end of 2021. If we exclude the enterprises that have announced termination of their operations in Russia, we come to about 195 thousand, to which the results of the survey can be extrapolated with expected losses of 1.5%. In absolute values, these losses will amount to 2.9 thousand people. This means that the total decrease in the total number of profile-specific specialists of Russian software companies can reach a maximum of 13 thousand people.

About 500 thousand software development specialists work in other industries and government agencies (in IT services, in IT companies and insourcing companies that are not software). It is quite possible to apply the indicators of losses of companies surveyed by the RUSSOFT Association to these specialists, since no one is purposefully engaged in their relocation, and they almost do not participate in international projects. It follows that from 0.5% to 1.5% of these specialists can quit their jobs and can leave Russia, which is 2.5–7.5 thousand people. Together with the losses in the software industry, a maximum figure of

20.5 thousand people is obtained, but, most likely, it is much less in the first half of the year. The scale of migration abroad after the announcement of mobilization is difficult to estimate with no additional survey. Most likely, the vast majority go temporarily to neighboring countries, continuing to work for Russian software companies remotely. It follows that such a majority of those who are leaving do not yet represent losses for the Russian software industry.

The same approach applies to all other IT professionals in Russia. At the beginning of 2020 the APKIT Association estimated the number of specialists employed in the ICT industry at 1.8 million people. With account for the increase in this indicator over 2 years and exclusive of software developers, estimated losses from migration abroad range from 6.5 thousand people to 19.5 thousand people. Most likely, this figure is closer to 6.5 thousand than to 19.5 thousand since it is Russian software developers who are primarily in demand abroad, and the demand for other IT specialists, although some, is much lower.

Thus, the total losses in Russia can amount to 40 thousand IT specialists in the first half of the year. This figure was obtained based on the most pessimistic scenario, and the realistic one assumes not more than 30 thousand.

According to the hh.ru portal, the share of IT specialists who allow for relocation from Russia has increased in the spring 2022, but slightly. In the period from February 8 to February 26, 2022, the share of CVs in the IT sector with the status of a desired or possible relocation as a whole in Russia was at the level of 36%, which is on average 2 percentage points lower than the level of 2021. Since February 28, the number of such CVs in IT has only increased, and in mid-March it has exceeded the level of the last year.

By the end of spring 2022 over 40% of resumes in the country indicated the status of readiness for relocation, which is 1.5 percentage points higher than in March 2021.

The possible reduction of headcount due to migration abroad is significant, but still not catastrophic for the software industry, even if you consider that it will be not the worst software developers who will leave the country. Some company executives regret that the best are leaving, while others are happy that they are staying. Apparently, the most experienced and competent employees both leave and remain.

The reduction of personnel as a result of migration abroad will have a greater negative impact on foreign sales of software companies, while its impact on the implementation of projects within Russia will be insignificant. Catastrophic consequences are more likely be experienced by those companies which terminate their operations in Russia.

At the same time, there is also a reverse flow. It is unlikely to be comparable to the drain of the personnel, but it is definitely noticeable. Its presence is noted not only by the heads of software companies, but also by foreign media. For example, the British newspaper The Guardian in April 2022 reported on the mass return to the homeland of those Russians who have left after the start of a special military operation.

Quantifying this backflow across IT is very difficult and hardly makes sense. The situation was very uncertain and could swing both one way and the other. In spring 2022, many IT specialists did not make a final decision themselves. Some who have agreed to the relocation suddenly refuses it, and those who have declared their stay in Russia optioned to leave. Some return only to prepare their

final move to another country, but may also change their mind.

Many IT specialists moved to neighboring countries (most often to Georgia, Armenia or Uzbekistan, where, due to the inflow of well-paid specialists, the cost of office and residential premises rentals increased sharply), as well as to foreign sea resorts, staying in hotels. Departure to such foreign countries looks temporary. It is possible that from such foreign countries IT specialists can either return to Russia or can move to Western countries.

All existing losses do not look non-recoverable at all. Much depends on what conditions for work and life will be existing in Russia and in the countries selected for relocation. Not the least role in this is played by the awareness level of specialists. It can be assumed that many software developers have decided to leave Russia due to the lack of an objective idea of the conditions abroad, as well as due to deliberately disseminated fake information on what is happening in the world.

It is known that some software developers already regret that they have left Russia, but they, for example, have a two-year contract that does not imply the right to return during these two years. But the reverse process may also take place if the state is forced to resort to mobilization (even if partial).

Marketplaces of professional opportunities and project collaborations have become an integral part of life and business. Changing jobs is almost pointless, and in some situations, even reckless. There are no longer critical barriers to exchanging competencies without switching to a new employer. IT professionals are engaged "on-demand" and can work on multiple projects simultaneously That's why hybrid teams with customers have become the norm in the IT industry.

Ruslan Gainanov
Founder Team Force

TF TEAMFORCE

5.3.2. Inflow of Personnel from Abroad

The question about the share of new employees hired in 2018 and arrived from abroad was introduced in the questionnaire of the survey conducted in 2019 and this question made it possible to calculate the number of programmers who have come to Russia from abroad. As a result, the inflow of foreign specialists hired by Russian software companies was estimated at 400–500 people in 2016–2017. It is possible that there were slightly more such specialists, as some respondents may not have had full information about the hired employees in the companies where they work.

At the end of 2018, calculations showed that more software developers arrived to Russia from abroad — about 600–700. With account for the fact that some specialists who have arrived settled in other industries, the total inflow was estimated at about 2–2.5 thousand people.

In 2015, 20% of surveyed companies hired foreign software developers, with 18% in 2016, and 14% in 2017. However, in 2016–2017 the absolute number of specialists arriving from abroad did not change. In 2018 both the share of companies hiring foreign specialists (up to 21%) and the number of these specialists have increased. In 2019 these indicators continued to grow (22%). The total number of foreign specialists in software companies was approximately 2,850 people.

It is possible that the accuracy of calculations has improved due to changes in the questionnaire — only one question was introduced instead of two questions, which allowed respondents to provide more accurate data. At the end of 2020 the inflow of personnel into the industry turned out to be approximately the same as a year earlier (about 3 thousand), but the share of companies hiring foreigners was 16.2%.

The results of the survey indicate that in 2021 the inflow of specialists from abroad has decreased by about 3 times, but since there was no other confirmation of this fact, most likely the decrease was not so significant. The share of companies hiring foreigners has decreased to 12.3%.

In April 2022, it became known that the Government of the Russian Federation developed amendments to simplify the issuance of a residence permit to foreign IT specialists. Market participants believe that new rules can attract mainly IT specialists from the CIS countries to the country.

In February 2022, the IT Ukraine Association released a study on the situation in the Ukrainian IT industry. According to experts, the number of IT specialists in the country in 2021 increased by 17% compared to 2020 and reached 285 thousand people. In March it became known that since the start of the Russian special operation, 3/4 of all IT specialists left Ukraine — about 200 thousand, but there is no data on what share of them moved to Russia. Most likely, most went westbound.

The inflow of personnel into Russia may be facilitated by the fact that the conditions for life have worsened in many Western countries. Some big companies have started massive cuts. For example, in July 2022 it became known about mass layoffs in Oracle. The American company is forced to reduce its staff against the background of growing costs.

KMPG and the Recruitment and Employment Confederation (REC) reported in January 2022 that the growth in the number of newly opened IT vacancies in the United States was replaced by a rapid fall.

According to Gartner analysts, the acute shortage of IT specialists in the world,

which was formed by mid-July 2022, will be gone by the end of 2023, as by this time many companies will complete or slow down their digital transformation programs. Against this background, IT specialists will receive time for advanced training or retraining. For now, however, the shortage persists. According to a study conducted by Gartner, by mid-2022 the IT labor market has continued to shrink, making it difficult for companies to attract new specialists and to retain staff already working for them.

In autumn 2021, IT workers in the United States have faced the decline in average wages. Wages have decreased by 1.1% over the year. There are several reasons for this phenomenon, and among them is the desire of employers to hire less experienced specialists who are, consequently, less demanding in terms of the level of compensation. The analysts of the Hired recruiting platform came to the conclusion that the average salary of specialists in the IT industry was reduced. Their data apply only to the United States, but this could potentially happen in other countries of the world.

In summer 2022, analysts of the authoritative Zdnet portal have predicted a rapid drop in the need for IT specialists around the world. According to their forecasts companies will impose restrictions on the recruitment of new personnel and will start cuts in already existing IT departments. This is already happening in some large companies, but this has not yet become a trend. If these forecasts are justified, IT specialists will risk to start to receive fewer job offers and will be forced to become more flexible in matters of their compensation.

5.4. Labor Compensation

5.4.1. Average Wages in Russia, in IT-sphere and in Software Industry

The average wages (measured in rubles) in the software industry were growing in all years of the RUSSOFT survey. During crisis periods (2009–2010 and 2014–2015), growth rates only decreased — from 10–20% to 8–10%. Software developers have always had an increase in income, but during the crisis it could not cover losses from inflation and even the decline in dollar terms due to the devaluation of the national currency.

At the same time, the average salary in the software industry has always grown relative to the same indicator for the entire Russian economy. Only in 2017 the obvious advantage of software developers in terms of salary growth rates was not revealed for the first time. Most likely, the wages of programmers still increased a little more (by 1–2 percentage points) than the national average for all industries, but for the first time the difference appeared to be so insignificant.

In other industries, even the nominal incomes of workers in the last 2–3 years either did not grow at all, or have decreased, while the real ones have definitely decreased. In 2017, there was a partial compensation for these losses, which software developers essentially did not have.

In 2018–2019, the increase in average wages of software developers and the increase in nominal accrued wages of workers in the Russian economy as a whole (data of the Federal Service of State Statistics) were completely equal. According to RUSSOFT calculations salaries of profile-specific employees in the industry increased by 12.1% in 2018 and by 5.8% in 2019, and in

the entire economy — by 11.6% and 7.5%, respectively (the official average salary in Russia in 2019 was RUB 47.5 thousand). There are discrepancies between these data, but, given the available calculation error, they are insignificant.

At the end of 2020, the average salary of software developers increased by 11.1% in ruble terms and slightly decreased in dollar terms (by 0.4%).

At the same time, the average nominal salary in Russia for all industries in 2020 amounted to 51,083 rubles, which is 6% more than a year earlier (data of the Federal Service of State Statistics). Consequently, the salaries of software developers have again showed a bigger increase.

This trend remained in 2021 — the nominal average wage in the country increased by a quite decent 11.5% (above inflation, which amounted to 8.4%), but the growth of average wages of profile-specific technical specialists in software companies was higher — by 17.4%.

As applied to software developers, the Russian labor market is just part of the world. This is why programmers not without reason often focus on measuring their income in dollars. The evaluation of the dynamics of average wages made in dollar terms shows that in 2017 the wages of Russian software developers have increased by about 24% (largely due to the strengthening of the ruble). However, in 2018, as a result of the weakening of the national currency, the dollar average salary has increased by only 4%. The growth in 2019 in dollar terms was insignificant — by 3.2%, and in 2020 there was a slight drop (by 0.4%).

According to the results of 2021, the wages in dollar terms have increased by 14.4%, which made it possible to come close to the level of 2013. So far, the income of programmers is below this level by almost 4%, but if the average annual dollar exchange rate in 2022 is significantly lower than in 2021, the level of 2013 will be surmounted and, most likely, surmounted with a margin. At the same time, over the past 10 years, wages in US dollars in the world labor market have been growing (in some years, the increase was estimated at 5–10%). Consequently, the competitiveness of custom development in Russia remains quite high. Another thing is that this development was in demand primarily in the USA and Western Europe, and the corresponding markets are currently closing for Russian companies. Competencies and experience in complex projects implementation are more important for working in other markets than the cost of the man-hour.

In 2021 average wages increased in 77% of surveyed software companies, decreased — in 1.3% and did not change — in 21.7% (in 2020 the distribution was approximately the same: growth — in 74%, reduction — in 2.3%, unchanged — in 23.7%).

By the beginning of 2017, the average wage in the software industry in Russia reached RUB 82–84 thousand, by the beginning of 2018 it amounted to about RUB 90 thousand, by the beginning of 2019 it exceeded RUB 100 thousand. With an annual growth of 6% by the beginning of 2020 it is approximately RUB 106 thousand. By the beginning of 2021 the average wage increased to RUB 119 thousand, and by the beginning of 2022 — to RUB 139 thousand.

Change in average wages in Russian software companies surveyed by RUSSOFT in 2014–2021

	2014	2015	2016	2017	2018	2019	2020	2021	Total for 7 years (from 2013 to 2021)
in ruble terms	+11.6%	+8%	+10%	+7.7%	+12.1%	+5.8%	+11.1%	+17.4%	+121%
in dollar terms	−6%	−32.5%	0%	+24%	+4%	+3.2%	−0.4%	+14.4%	−3.8%

The presence of a significant increase in the average wage of programmers in 2021 is confirmed by various sources. From the report of the Rabota.ru service it follows that the wages of IT specialists in Russia since the beginning of the summer of 2021 have increased by 20%.

According to the analysis of the wages level of 13,000 IT specialists, which was conducted by the Habr Career portal, the wages level in the second half of 2021 increased by 17% compared to the first half of 2021.

According to the SuperJob service, salary offers in IT increased by 18.9% in 2021.

For testers, the increase from mid-2021 to mid-2022 amounted to 20–25%.

The Superjob wage index in the Information Technology sphere grew by 35% from January 1, 2021 to January 1, 2022.

In the first 8 months in 2022 the growth of wages continued in the field of software development, but its pace most likely decreased slightly.

As in the previous few years, average wages growing faster in the regions. This is largely facilitated by the widely used method of hiring specialists without inviting them to the company's

existing office (the remote operation of the specialist is supposed). One of the companies located in Crimea reported an average salary increase of 200%, explaining such an increase by the fact that due to the pandemic and the widely used remote work mode, it is required for the company to directly compete with larger software enterprises in Moscow and St. Petersburg.

According to the results of the survey conducted by RUSSOFT, the average salary in Moscow software companies in 2021 increased by 14.3%, by 12.7% in St. Petersburg and by 21% in other cities and towns.

5.5. Knowledge of Foreign Languages

Data were collected by RUSSOFT on the number of specialists fluent in foreign languages as part of annual surveys conducted only until 2016. Since the indicators for the year have changed only slightly this question was not asked to respondents in 2017–2021. It can be assumed that the indicators at the end of 2021 turned out to be approximately the same as

they were at the end of 2015, but by the end of the first half of 2022 they were significantly reduced, since there was a massive departure of specialists abroad. Naturally, those specialists who are fluent in English or some other foreign language have moved to foreign countries. Consequently, the shortage of developers with the knowledge of foreign languages has increased.

The share of employees of Russian software companies who speak English well has always steadily been about 70%. Apparently, this indicator has stabilized after a consistent increase over a number of years. The share of German-speaking specialists in the surveyed companies has always been at the level of 8–10%. About the same share of employees speak other foreign languages.

**Share of employees who are fluent in foreign languages
(based on the total headcount of the companies surveyed)**

	2008	2009	2010	2011	2012	2013	2014	2015
English	65%	65%	68%	68%	72%	67%	75%	74%
German	10%	11%	5%	8%	8.5%	9%	8%	11.5%
Other	3%	11%	4%	8%	9.5%	11%	10%	13.5%

However, the number of employees speaking English will be much lower in the companies with no account for the employees of foreign development centers of Russian companies (according to a survey of 2016 the share of English speaking employees was approximately 55–57%). The same trend applies to German and other languages (excluding knowledge of languages by employees of foreign centers, the share of such employees will be 2–3%).

Among the "other" languages (in addition to English) in 2016, respondents mentioned German — 9 times, Spanish — 6 times, and Dutch, Italian, Korean, Latvian, Lithuanian, Finnish, French, Czech — 1 time.

Despite the obvious progress in mastering foreign languages by

employees of software companies, many problems remain unresolved. The number of English-speaking employees was not sufficient in small and regional companies. The growth of the total number of such employees was provided by the largest companies located in Moscow and St. Petersburg.

The number of English-speaking employees in IT companies was increased not due to the improvements in the Russian state education system. Developers mostly learn a foreign language at their own expense or at the expense of an employer who pays for language courses or who hires teachers to train employees at the company.

In Russia qualified teachers of foreign languages, as a rule, do not look for employment in schools and

universities due to low wages. Given the division of the world into "friendly" and "unfriendly" countries, the need for specialists who speak different languages (primarily Spanish, Chinese, French) is growing. This problem should be addressed by the government. Otherwise, the high-tech sector of the economy with respect to its international competitiveness will not correspond to the potential for technical specialists training that Russia has.

In 2022, the question on the knowledge of foreign languages was again included in the questionnaire, but it involved the feedback not on the number of specialists actually fluent in any foreign language, but on the required number of such specialists. This question is formulated as follows: How many technical specialists (developers) with

a good knowledge of foreign languages are you ready to hire additionally, if only the inability to attract them without luring them from other companies with higher wages offerings restrains your company's entry into new markets and expansion of sales abroad? Similar information was received regarding promotion specialists (marketers, sales managers, PR).

The results appeared to be generally expected: the greatest need for specialists with the knowledge of English, which allows to promote the solutions and services of the company even in countries in which English is not an official national language. In cases when the developers with the knowledge of a foreign language are needed, 78% of such developers should be fluent in English.

It is more interesting that Chinese ranked second. The need for the knowledge of Chinese is an order of magnitude lower than that of English, but in previous years the second place was confidently occupied by the German language. That is, English ranks first by a huge margin, those who speak German were 6–7 times less, and the number of employees speaking other languages was 2–3 times less. Although then it was not about the need, but about the actual availability of specialists with the knowledge of foreign languages, it can be assumed that a radical change has emerged. In any case, it is difficult to imagine that in 2015 there was at least some significant demand for specialists with the knowledge of the Chinese language.

German ranked not even third, but forth, losing also to the Spanish language. This is due to the fact that in a number of "friendly countries" the state language is Spanish.

Need for technical specialists (developers) with a good knowledge of foreign languages

	% of the total staff of all companies surveyed	% of the total staff of only those companies surveyed that have indicated a need
English	3.24%	9.01%
Chinese	0.30%	0.83%
Spanish	0.18%	0.50%
German	0.17%	0.46%
Arab	0.13%	0.36%
French	0.07%	0.19%
Japanese	0.05%	0.13%
any foreign language	4.1%	11.5%

The need for technical specialists (developers) with a good knowledge of foreign languages, depending on the share of exports in the revenues of the company

	no export	exports accounts for less than 50% of turnover	exports accounts for more than 50% of turnover
English	3.66%	2.05%	7.24%
Chinese	0.37%	0.22%	0.56%
Spanish	0.23%	0.23%	0.03%
German	0.25%	0.11%	0.35%
Arab	0.33%	0.16%	0.01%
French	0.21%	0.06%	0.08%
Japanese	0.19%	0.06%	0.00%
any foreign language	5.3%	2.9%	8.3%

The total need for an additional number of specialists speaking foreign languages in the software industry is estimated at about 9 thousand people, of which almost 7 thousand people must be fluent in English.

The opportunity to mention another foreign language (except for those offered as a choice to the respondents) was taken by only two companies surveyed: Portuguese and Vietnamese were mentioned.

If we analyze the need for technical specialists (developers) with a good knowledge of foreign languages depending on the share of exports in the revenues of the company, we can note a fairly high demand from the part of companies that in 2021 did not have export revenues at all.

The rating of languages the knowledge of which is desirable for software promotion specialists is almost the same as the same rating for technical specialists. There is only one significant difference: the German language was in 5th place, losing to the Arabic language.

Specialists with the knowledge of the Arabic language turned out to be the most popular in companies that did not have export income in 2021 (most of them did not have experience in foreign markets at all), they were second in demand losing only to specialists with the knowledge of English. This suggests that a significant part of companies operating so far only in Russia is considering the start of foreign expansion from entering the markets of the Middle East. However, Chinese is almost as important to them.

Need for promotion specialists (marketers, sales managers, PR) with a good knowledge of foreign languages

	% of the total staff of only those companies surveyed that have indicated a need
English	5.61%
Chinese	0.79%
Spanish	0.66%
Arab	0.46%
German	0.43%
French	0.33%
Japanese	0.13%
any foreign language	8.4%

Need for promotion specialists (marketers, sales managers, PR) with a good knowledge of foreign languages, depending on the share of exports in the revenues of the company

	no export	exports accounts for less than 50% of turnover	exports accounts for more than 50% of turnover
English	6.40%	5.54%	5.83%
Chinese	0.85%	0.91%	0.42%
Spanish	0.66%	0.64%	0.73%
German	0.47%	0.37%	0.63%
Arab	0.94%	0.54%	0.21%
French	0.47%	0.37%	0.21%
Japanese	0.28%	0.14%	0.10%
any foreign language	10.1%	8.5%	8.1%

TECHNOLOGIES

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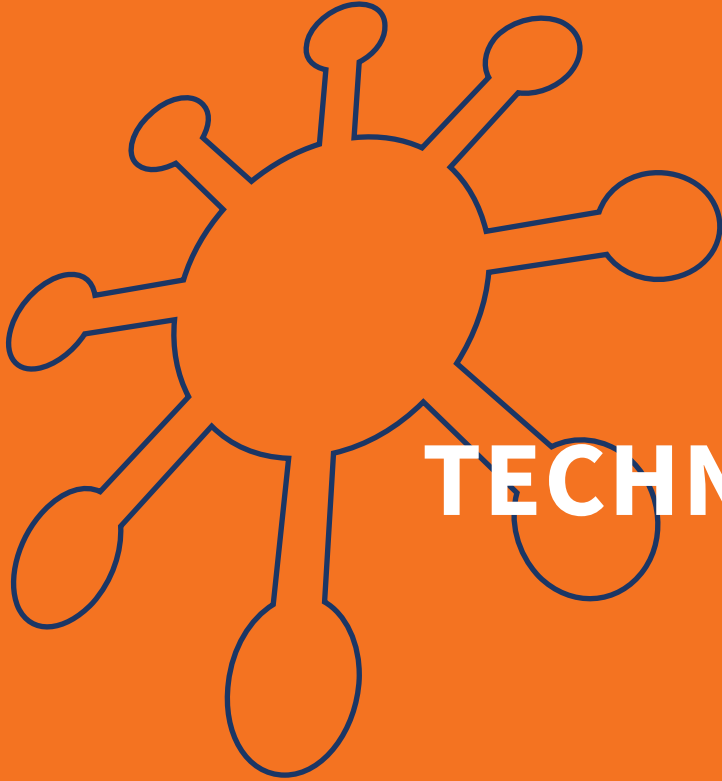
TRENDS IN ARTIFICIAL INTELLIGENCE

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Artificial Intelligence (AI) remains the technological prime mover in developing most industries. The global AI market had reached $136.6 billion by 2022 (GrandViewResearch), and is expected to rise to $1.8 trillion by 2030, with a CAGR of 38.1% (up from 34.3% last year).

The variability of AI use scenarios is also on the rise. Technological advances made it possible by unlocking AI transformers' potential, fostering new architectures (wav2vec, HuBERT), building up data volumes ready for analytics, and perfecting ML model learning. Conversational AI thrives with new approaches that streamline its word concordance, adjust endings and punctuation, remove "verbal noise" such as slips, interruptions and filler words, and correct errors automatically. It makes speech recognition easier to apply. Consequently, the tasks where AI shows great results become significantly more complex. The use scope of mass-market digital services is expanding: voice assistants can help you compute your taxes, check your documents or any specific information, and even procure documents or references for you, performing an end-to-end commercial or government liaison role.

Some modern trends are:

- **High demand for internal communication data mining**
  The value of executive meeting takeaway data—decisions made, tasks assigned, project statuses, etc.—is up. As meetings become more frequent, especially online, the use of speech recognition to facilitate attendance for internal meeting participants expands accordingly. Another improving aspect is post-processing of the recognition results to improve readability, including endings adjustment and correction of incorrectly recognized words. NLU is more widely applied where the need exists to automatically highlight and generate outcomes and follow-ups on meetings without human involvement.

- **Robots sound more like humans**
  Dialogue assistants at call centers get the capability to anticipate the interlocutor's intentions in the course of a conversation. They will be able to delve even deeper into the context and emotions, adapting to the target audience and making services progressively more personalized, both in business and the public sector.

- **Creative and generative AI**
  The success of generative AI models shows that the approaches they employ are increasingly more relevant where the idea is to create radically new content. Eventually, in addition to generating texts, pictures and music, AI will be able to create the desired audio and video content along the lines of corporate virtual avatars almost instantly.

- **Face and voice biometrics-based solutions are being integrated in various fields worldwide. Notable progress in anti-spoofing technology (protection from different types of attacks)**
  Liveness detection technology protecting facial recognition data steadily improves while the machine, through speech recognition learning, becomes ever more adroit at detecting voice deep-fakes. AI is deployed to identify fraud patterns in speech communication, helping to counter them.

- **The role of AI is shifting from mere task automation to making staff work faster and easier altogether**
  Voice AI becomes the core of familiar processes, enabling a dramatic upswing in the quality of familiar services and boosting productivity without the need to alter the infrastructure.

6.1. Technologies used

During the survey performed in 2020 among software developers as part of the RUSSOFT annual study, the question regarding the rate of popularity of operating systems (OS), database management systems (DBMS) and programming languages was changed. Instead of simply mentioning the technology, respondents were asked to estimate (based on the time spent on corresponding solutions and applications development) the ratio of accounted for each technology used. As a result, it became possible to obtain a more objective picture, since at previous assessments of software popularity based on a single vote those technologies could be scoped out which were used in a company in completely different extents.

The change in the popularity of OSs, DBMSs, and programming languages could well be monitored in previous years, but with less accuracy.

At the same time, to assess the popularity of a particular technology the method of performance of the survey should be accounted for, i. e. the number of

companies participating in the survey, and the changes in the composition of participants from year to year. In a stable situation, this composition and the number of companies surveyed change only slightly, but at any upheavals, some adjustments and reservations should be made.

For example, due to a much larger number of respondents in the survey performed in 2021, more accurate data were produced in the result of the survey regarding both the number of references and the intensity of programming for different operating systems and DBMSs, as well as regarding the intensity of the use of programming languages as compared with 2020, in which year the questionnaire did not turn out to be full due to the outbreak of the pandemic and the resulting huge uncertainty.

It should be noted that with a significant increase in the number of respondents, the percentage of small software companies participating in the survey also increased, with these companies indicating on average a much smaller

number of operating systems, DBMSs and programming languages than the number indicated by large enterprises. Accordingly, the average rate of these systems, DBMSs, and languages mentioned also decreased. Thus, it cannot be concluded that most operating systems, DBMSs, and programming languages became less popular in 2021 in comparison with 2020. Nevertheless, various comparisons can be made (for example, compared with data obtained during surveys performed in 2019 and 2018, when there was a more similar structure of the array of polled companies).

The peculiarity of the survey performed in 2022 consists of the fact that many companies with a large share of exports in the revenue structure could not participate in the survey. For this reason, the percentage of such companies has decreased significantly. However, it is easy to adjust by comparing the survey data of companies with different shares of exports. Moreover, the share of exports has a clear impact on the popularity indicators of only 2 or 3 operating systems and DBMSs.

6.1.1. Operating Systems

With regard to the popularity of operating systems among software developers, several obvious trends can be noted with account to all random fluctuations over the past 14 years. Firstly, the frequency of MS Windows mentions has decreased (from the original 94-97% to 84-88%, and to 74-79% in the last 3 years). The times when almost all surveyed developers created solutions for Windows, apparently, forever became a thing of the past. It can be assumed that starting the next year the descent of this indicator will resume.

In 2020, the GNU Linux family even took the lead, slightly overtaking Windows. The increase in the number of Linux mentions is quite consistent with the trend revealed in previous years. The reliability of the sharp drop in the popularity of Windows was somewhat doubtful. The survey performed in 2020 was not entirely complete due to the insufficient number of companies participating in the survey. For this reason, it was not worth rushing to declare the obvious leadership of GNU Linux.

In 2021, in terms of the number of OSs mentions, Windows again took first place with a quite decent lead from the GNU Linux family. However, if related UNIX-like systems (Android and Tizen) are added to GNU Linux, the percentage of companies mentioning at least one system from this group will be 82%. This figure turned out to be more than that of Windows, even with the addition of MS Windows Mobile and MS Windows Phone, which no participant has mentioned separately from Windows. Due to the fact that the

2021 survey was conducted with an increased number of respondents and that this survey gave quite reliable results, the superiority of the GNU Linux family over the Windows family's popularity among software developers can be declared with more certainty.

In a survey performed in 2022, the GNU Linux family came out in 1st place, but at present shares this 1st place with Windows. 79% of surveyed companies develop solutions to suit both operating systems. However, if all Linux-based operating systems are compared with the entire Windows family, then a clear advantage of Linux can be noted – 88% versus 79%.

Already in 2021 MS Windows Mobile and MS Windows Phone had virtually zero indicators. Therefore, they were not included in the new rating of the most popular OSs. Oracle (Sun) Solaris and Tizen with very low scores also were not included in this rating. In 2021 Oracle Solaris was mentioned by only 3% of surveyed companies, although 2 years before the number of mentions accounted for 13%, and for 26% in 2008. However, the intensity of development for this OS is already almost zero. A few years ago Oracle has massively fired Solaris developers. Although the complete cessation of development and support for this OS has not been announced, its revival is already considered unlikely.

The mobile Aurora (Sailfish) software was added to the rating, this software is slowly but surely becoming more popular among developers of software for mobile devices.

Top-7 most popular operating systems among Russian software companies, % of surveyed companies

	Software Title / Year of /Survey	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	MS Windows	97%	94%	93%	96%	94%	88%	92%	87%	93%	84%	89%	88%	74%	79%	79%
2	GNU Linux family	64%	54%	54%	59%	60%	65%	51%	59%	60%	57%	59%	72%	76%	67%	79%
3	Android	—	—	6%	4%	37%	33%	43%	36%	43%	39%	53%	58%	60%	49%	49%
4	iOS	—	—	—	—	28%	24%	34%	29%	35%	36%	49%	49%	50%	41%	41%
5	Mac OS	26%	9%	15%	19%	32%	31%	33%	32%	33%	37%	48%	48%	31%	20%	17%
6	Open/Free/NetBSD	25%	7%	9%	9%	13%	10%	14%	13%	11%	11%	19%	22%	8%	7%	8%
7	Aurora (Sailfish)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5%

According to a survey performed in 2021, the MS Windows operating system also lost its sole leadership in terms of the share of time spent on the development of solutions and applications: the figure for both UNIX-like open-source systems (GNU Linux, Android, and Tizen) and the Windows family (with MS Windows Mobile and MS Windows Phone) is exactly the same. However, some UNIX-like systems fell into the "Others" category (primarily Aurora instead of Sailfish), and the share was not calculated separately for these systems. Therefore, the Windows family, although by a tiny amount, is still inferior also in the sense of intensity of the development of solutions for the OS. In addition, there is also a proprietary UNIX-like Oracle Solaris system with an indicator of 0.1%.

The entry of UNIX-like operating systems to the leading position was predicted by RUSSOFT analysts several years ago and was predicted to happen in 2022 or 2023, but this entry happened earlier – at the end of 2020, which became known in 2021. However, the advantage of these OSs is defined as little to nothing and is therefore not obvious. There is no doubt in 2022 that in Russia the development of software for Linux and other UNIX-like systems is conducted more actively than the development for all types of Windows.

To capture a leading position, the Linux family does not even need any support from related mobile systems (Android, Tizen, Aurora). When considering the data of the survey conducted among 175 companies (with a total number of development specialists of 23.6 thousand people) related to the answers to the corresponding question about the share of applications development for different operating systems, the share of Windows is only 28.2%, while the share of Linux is 48.8%. The results of a survey of only software companies (IT companies with development personnel but with software development being not their main activity also participated in the survey) give Linux a not so significant advantage over Windows – 40.0% versus 35.7%. In these companies, 17 thousand specialists are engaged in software development.

Linux will still enjoy superiority (38% versus 36%) even if the data are adjusted to account for the fact that many companies with a large share of exports in revenues could not participate in the survey performed in spring 2022. With any calculations, it is obvious that the share of Linux has been growing in recent years, and the share of Windows has begun to decline since 2021. After the announcement that Microsoft will stop working in the Russian market, it is easy to assume that by the end of 2022 the share of

Percentage of major operating systems by time spent for the development of solutions and applications for these operating systems

	in 2019	in 2020	in 2021 *
MS Windows	42.5%	42.9%	28.2% (35.7%)
Linux Family	30.0%	32.5%	48.8% (40.0%)
Android	7.8%	9.9%	9.3% (9.2%)
iOS	6.8%	7.7%	7.8% (7.2%)
Mac OS	8.9%	4.1%	3.5% (4.4%)
Open/Free/NetBSD	3.9%	1.1%	1.3% (1.8%)
Tizen	0.2%	0.5%	0.3% (0.4%)
Aurora (Sailfish)	—	—	0.3% (0.4%)

* — only data for software companies (IT companies that have developers who took part in the survey, but software development is not their main activity) are indicated in parentheses

Windows will decrease even more, and the share of Linux will increase. Most likely, both changes will be more significant than in 2021.

Of course, users are very reluctant to switch to other operating systems from the already familiar one. However, the motives of software developers to maintain their commitment to MS Windows and its package of MS Office applications are becoming weaker and weaker every year. Since 2022, the need to switch to Linux already looks mandatory. At the same time, it was realized not only in Russia, but also in many other countries (even in the USA), this transition is quite widespread, but mainly for economic reasons, since the use of a PC with Linux can be much prolonged in comparison to the use of a PC with Windows.

For other operating systems, only a steady decrease in the share of Mac OS in the last 2 years can be noted. It

did not come close to zero only thanks to exporting companies. Since Apple has supported anti-Russian sanctions, the development of software for the operating system (Mac OS and iOS) of Apple by Russian companies is unlikely to increase. Such development is likely to shrink.

Unlike Sailfish (Aurora), Tizen OS for mobile devices was not included in the Register of Domestic Software (only Smart TV Tizen was included). In spring 2018 the state-owned corporation Rostelecom proposed that the Russian government shall make it mandatory for public officials to use smartphones based on the domestic Sailfish OS. Experts questioned the fact that it would be possible to switch to the mass use of the Sailfish OS in this way, since the devices with this system will have limited functionality. In addition, as a rule, government employees, use their own smartphones, on which they install the applications they need to work.

In early 2019 Sailfish received the Russian-language name – "Aurora." Promotion under a new name has become more active.

It also became known in June 2019 that the Russian corporate messenger PostLink became the first Russian corporate software with the implementation of voice calls for the Aurora mobile OS. In 2019 Aurora OS was also first mentioned in the framework of the RUSSOFT annual survey.

In November 2019 it turned out that Russian Railways was ready to introduce the Russian "Aurora" mobile OS to the employees of this company. The relevant agreement was signed between "Russian Railways" JSC, "Open Mobile Platform" LLC, and "Branch Center for the Development and Implementation of Information Systems" LLC (the subsidiary of "Russian Railways" JSC). This Agreement is aimed at the implementation of pilot projects to introduce hardware solutions for specialized mobile devices used by the employees of Russian Railways based on the domestic mobile operating system.

The information appeared in March 2022 that the Russian trusted mobile phone for confidential communication Ayya T1, originally released on Android, was launched under the control of the Russian operating system "Aurora".

"Aurora" has earned the right to enter the top 8 most popular operating systems under development in Russia. However, it cannot yet be said that its popularity is growing rapidly.

Due to the fact that, under pressure from the US authorities, Google began to use its Android operating system as a tool of political pressure (new smartphones of the Chinese company Huawei may not have updates to this OS, as well as related services from Google), in 2020 there were doubts about the further growth of popularity of Android. There were incentives to more actively create alternative operating systems with full functionality. Such OSs have already appeared in China, Russia and in other countries, although the transition to these OSs in Russia was not very fast.

In mid-January 2020, it became known that Huawei is starting to pay developers to create applications for the proprietary operating system of this company – Harmony OS. Thus, this Chinese manufacturer is accelerating the development of its own ecosystem in order to reduce and completely eliminate its dependence on Google services.

Information appeared in March 2022 about the termination of licensing of Android-based smartphones produced by Russian manufacturers by Google. This means that these manufacturers will not be able to produce devices with pre-installed Google services, such as the Chrome browser and the Google Play app store.

The data of the survey conducted by RUSSOFT has not yet shown the obvious negative impact of political games on the growth of the popularity of Android, but this growth has definitely stopped.

Among other operating systems (not included in the top 10), respondents in recent years have mentioned mainly real-time operating systems – for example, QNX, VxWorks, ThreadX, MQX, Contiki, LynxOS, RTOS. And, as a rule, these were single-time mentions. Until 2016 the number of mentions of real-time operating systems was increasing from year to year, which was consistent with global trends. According to the results of surveys conducted in the last 5 years, such an increase has not been observed, but 3-5% of companies consistently indicate their use of such systems. In 2022, 2.9% of respondents indicated development for various real-time operating systems (3 times QNX and its branch Neutrino, Nucleus and FreeRTOS once each).

In addition to the real-time OSs, the following OSs were mentioned once each: BareMetal OS used to achieve high-performance computing with minimal cost, and proprietary UNIX-like FreeBSD OS.

In 2021 9 respondents (4%) indicated the development of software not for a specific OS, but for browsers, or reported the development of cross-platform solutions. The number of such answers became less in 2022 – 4 (2.2%).

If we compare the popularity of OSs for different categories of companies, then we can note that solutions for Android and iOS mobile operating systems are more often developed by companies in which more than 50% of revenues are coming from exports, as well as by companies whose head office is located outside of Moscow and St. Petersburg. Development for MS Windows and GNU Linux family is more required by companies receiving the main income in the domestic market.

The intensity of development of solutions for operating systems by companies with different export shares in total revenues and with different locations of the head office

	MS Windows	Mac OS	GNU Linux family	Open/Free/ NetBSD	iOS	Android	Tizen	Aurora (Sailfish)
Share of exports								
export less than 50%	31.8%	1.3%	53.0%	3.1%	4.3%	5.3%	0.5%	0.7%
export more than 50%	41.0%	8.7%	22.4%	0.1%	11.1%	14.5%	0.4%	0%
Head Office Location								
Moscow	33.4%	1.8%	48.3%	5.5%	4.3%	5.9%	0%	0.9%
St. Petersburg	35.6%	0.3%	56.8%	0.2%	3.0%	3.3%	0.5%	0.1%
Other regions	36.4%	7.1%	30.0%	1.5%	9.9%	12.9%	0.6%	0.4%

The range of operating systems mentioned only once has clearly narrowed in recent years. Nevertheless, completely new OSs are being developed. Apparently, the development of new OSs is really not needed for mass-produced PCs and smartphones. New versions of mobile operating systems appear when the current operating systems are discredited (for example, caused by the participation of Google with its Android OS in political games), but they will also be based on Linux.

New operating systems are created only for certain tasks and types of equipment (not for PCs and smartphones) and, above all, for the Internet of Things (IoT).

Reports appeared in the last few years on the plans to develop new operating systems in Russia. In March 2019 Kaspersky announced that the company was developing its own operating system with a developed security system. This OS appeared in the end of 2019 in two

versions – for the corporate segment, including government agencies, and for ordinary users. According to the company website, KasperskyOS allows to create cyber immune solutions resistant to most types of cyber attacks. This is especially important for industries and solutions with increased information security requirements. The company invites developers to create solutions for KasperskyOS, but not a single mention of this OS has yet been noted in the framework of the annual survey of software companies conducted by RUSSOFT.

In early 2022, it became known that work on the "Phantom" operating system of DZ Systems was being finalized. This OS was created from scratch and has unique characteristics. According to developers, this OS will be of interest for companies with special requirements to security – enterprises of the fuel and energy complex and military industry, objects of critical information infrastructure (CII),

banks. Apparently, the Phantom OS will also be used mainly in the Internet of Things.

6.1.2. DBMS

Until 2020, the frequency of mention of almost all major DBMSs included in the table insignificantly changed from year to year (as well as these DBMSs ranking based on this indicator). Random fluctuations of this indicator for each DBMS were not very large, but still they were encountered. Only a steady increase in the share of the free object-relational database management system PostgreSQL was exceptional.

For many years the three DBMS – MS SQL, MySQL and Oracle – remained most popular among the developers. They only sometimes changed places. In 2018 the composition of the first three changed for the first time: PostgreSQL made its way into it, pushing Oracle to 4th place. Over the past 3 years PostgreSQL has confidently taken first place both in terms of the number of mentions and in the intensity of development of solutions for DBMSs (more information on this is presented below). In 2021-2022 it became possible to indicate a decrease in the number of MS SQL and Oracle mentions, which cannot be explained by random fluctuations.

Over a long period, an increase was noted in the popularity of SQLite, a compact embedded DBMS. In 2010-2011 it was mentioned by 5-9% of respondents, while by 2019 this figure had grown to 35%. However, in 2020 this figure slightly decreased – to 29%, and to 12% in 2021. Based on the results of the survey performed in 2022 it is possible to say that this DBMS retained its position - it was mentioned by 15% of surveyed companies.

It is worth noting that in 2019 the many years leading MS SQL has yielded the championship to MySQL (an open source database for e-commerce, online transaction processing, developed and supported by Oracle Corporation). However, in 2020-2022, it still holds the

second place, being surpassed only by PostgreSQL.

In 2020 the range of DBMSs mentioned by at least 5% of respondents has sharply reduced. There are only 10 such systems, although in previous years their number was about 15. Since not a large number of companies participated in the survey in the year of the pandemic, verification of the results was required. The survey performed in 2021 confirmed the version according to which the number of popular DBMSs among developers has decreased: 5 and more percent of developers have only 7 systems: PostgreSQL, MySQL, MS SQL, Oracle, SQLite, Firebird and MongoDB. At the same time, all these most popular DBMSs (except PostgreSQL) recorded a significant reduction in the frequency of mentions (% of all surveyed companies). With no account for the data of a not entirely full-fledged survey performed in 2020, but with these data comparison with the results of the survey performed in 2019, this indicator will show growth only for MongoDB and PostgreSQL.

Thus, according to the results of surveys performed in 2021-2022, 10 DBMSs at once had such low frequency of mentions that did not allow to rate them among the most popular solutions. IBM Informix, IBM DB2, Sybase ASA, Sybase ASE, Linter, SAP DB, InterBase, Paradox, MSDE, MS Access were mentioned by not more than 5% of respondents, and software development for these systems on average took 0.1-0.2% of the working time of all specialists of surveyed companies). For these reason these DBMSs are excluded from the rating. At the same time, a new system – ClickHouse was listed in the rating. This DBMS was developed by the Russian company Yandex. It allows to store and quickly process large amounts of information for analytical reporting. ClickHouse very quickly wedged into the

list of DBMSs being most popular among the developers.

Apparently, the need for such a large number of DBMSs that respondents mentioned earlier has disappeared – 6-7 main and some other systems for specific tasks are enough.

Surveyed companies were given an opportunity to indicate other DBMSs for which they were developing software. Until 2022 (with the exception of 2020), up to 10 DBMSs were listed in the "Others" category. One of the systems – MongoDB – was subsequently included in the "Main" category.

Almost all DBMSs in the "Others" category were mentioned not more than 1-2 times (more often – only once). At the same time, not necessarily every year, but the composition of this category is constantly changing. Only Redis does not fall out of this trend, but respondents have never mentioned it more than 2 times. Cassandra DBMS was also consistently indicated 1-2 times, but in 2021 it was not mentioned not even a single time, while Redis was again mentioned 2 times.

In 2019 respondents first mentioned the ClickHouse DBMS developed by Yandex. In 2021 it was already mentioned by 7 respondents (4% of all surveyed companies) and in 2022 it became one of the main ones.

Almost 20 DBMSs, data processing platforms and data warehouses were mentioned in the "Others" category in 2022. Some of them were previously named among the main ones. Redis (4), the cloud corporate data storage Azure Table (3), Cassandra (2) were mentioned more than once. The rest were mentioned once: osmos DB, Graph DB, Greenplum (mass-parallel DBMS for PostgreSQL-based datastores), TPS

(transaction processing system), Jatoba, ElasticSearch (highly scalable distributed search engine for full-text search and data analysis), etcd (distributed storage of configuration parameters specified in the form of key/value), Tarantool, Hbase, Cockroach DB, NitrosBase (Russian high-performance DBMS supporting relational, graph and document data models), HANA (SAP resident relational DBMS), MariaDB, LINTER, OT.Platform (open universal platform for solving problems using machine learning methods without the need to involve ML specialists). Two companies indicated their proprietary DBMSs (one of them is Code Server, and the other is untitled).

Main DBMSs used, % of all surveyed companies

	Year of survey/ DBMS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	PostgreSQL	17%	15%	26%	30%	28%	28%	33%	36%	51%	66%	79%	78%	82%
2	MS SQL	63%	74%	70%	66%	70%	67%	59%	61%	67%	62%	58%	51%	47%
3	MySQL	47%	40%	59%	56%	56%	54%	42%	53%	61%	72%	54%	43%	41%
4	MongoDB	—	—	—	—	—	—	—	—	6%	10%	35%	26%	26%
5	Oracle	49%	55%	51%	47%	45%	39%	36%	37%	40%	41%	40%	31%	24%
6	SQLite	9%	5%	12%	10%	19%	12%	10%	19%	25%	35%	29%	12%	15%
7	ClickHouse	—	—	—	—	—	—	—	—	—	—	—	—	11%
8	Firebird	11%	9%	10%	13%	16%	15%	11%	11%	14%	13%	13%	5%	6%
9	Other	13%	8%	7%	8%	10%	9%	5%	9%	14%	13%	8%	12%	13%

Changing the wording of the corresponding question in the questionnaire used in 2020 made it possible to determine not only the number of companies using DBMSs, but also to learn intensively each company was developing software for the most well-known DBMSs. According to the second popularity indicator the leading position was still occupied by the PostgreSQL DBMS, which strengthens its leading position every year, increasing the lead from the second MS SQL to a huge one.

The new wording of the question to respondents showed that there were only 6 database management systems in the DBMS rating with an indicator that cannot be considered close to zero.

In 2021 the indicator of the intensity of applications development for PostgreSQL has increased slightly, while the same indicator has decreased for MS SQL and MongoDB DBMS. There are no obvious and unambiguous changes for the rest DBMSs. In 2022 growth is observed only for Oracle and PostgreSQL, and for the rest DBMS the number of mentions has decreased. The indicator for ClickHouse is likely to have increased, but there is no exact data on its popularity in 2021.

According to the survey completed by JetBrains company in summer 2020, the world 3 top used DBMSs (in 2019) had the following composition: MySQL (66%), PostgreSQL (36%), MongoDB (35%). In Russia, PostgreSQL (61%) was the leader with a big lead, MySQL accounted for 42%, MongoDB and Redis each accounted for 30%. JetBrains noted that Russians use ClickHouse 10 times more frequently.

Despite the fact that the range of especially popular database management systems is shrinking, in recent years new DBMSs required for fundamentally new tasks that did not exist before have been developed. Russian companies joined this work. For example, in 2016 the Mail.ru Group announced plans to break into the database management system market with its Tarantool open source DBMS. Tests of this DBMS were performed on domestic products, but it is planned that this system will be distributed (primarily as a replacement for Oracle) both in Russia and abroad. Respondents have not yet mentioned this system in their answers.

In November 2019 Nokia announced the development of a software solution for the automation of development operations in the field of industrial Internet of Things (IIoT, Industrial Internet of Things) based on the Tarantool DBMS.

In September 2020 the Mail.ru Group holding announced plans to invest RUR 300 million in the development of the Tarantool DBMS and its popularization around the world. The funds will be spent to improve this system security, to launch the support in English and to strengthen the international development team.

In early 2022 VK "Digital Technologies", a part of the Mail.ru Group holding, launched a cloud service for the Tarantool DBMS have been developed without installation on a computer.

VK has launched a service on which one can test the functionality of the Tarantool DBMS.

In April 2022 VK introduced a massive update to the Tarantool in-memory computing platform. After that the technology became available in three

The share of DBMSs by the intensity of applications development for these systems (data of surveys performed in 2020-2022)

		2020	2021	2022
1	PostgreSQL	35.8%	38.5%	47.1%
2	MS SQL	32.4%	29.2%	17.2%
3	Oracle	9.6%	10.0%	16.2%
4	MySQL	8.7%	9.3%	6.8%
5	ClickHouse	—	—	3.7%
6	MongoDB	7.5%	4.3%	3.0%

versions: an open source version for all developers and companies (Community version), On-premise version for large companies (Enterprise version) and Tarantool as a service in the VK Cloud Solutions (cloud version) cloud. New tools will improve the security and reliability during the use of high-load services and will reduce the total cost of ownership of the infrastructure.

Until 2021 inclusive, not a single software developer surveyed by RUSSOFT has mentioned Tarantool as the DBMS for which they develop applications. The first mention appeared in 2022.

In December 2021 it became known that Relex (the Russian developer of Linter DBMS) since 2017 has been developing its own scalable relational DBMS named Soqol and and that this system was already brought to the MVP stage. The unique architecture of the system made it possible to combine the best features of relational and resident solutions. Tests conducted by the developers show a significant performance superiority of this domestic solution compared with PostgreSQL.

In April 2022 Yandex published the source code of the Yandex Database (YDB) DBMS, the base for Taxi, Market and another 500 projects operation. Experts believe that the solution will be in demand in services based on Big Data technologies and when working with SQL and NoSQL databases. YDB is capable of processing millions of requests per second.

Yandex has published the source code of a distributed database management system.

The main DBMS used by companies of different sizes and with different shares of foreign sales, % of all surveyed companies

Year of survey/ DBMS	Size of companies		Overseas sales	
	turnover less than RUR 375 million (USD 5 million)	turnover more than RUR 375 million (USD 5 million)	less than 50% of turnover	more than 50% of turnover
PostgreSQL	76%	100%	81%	84%
MS SQL	44%	62%	46%	58%
Oracle	13%	62%	24%	16%
MySQL	43%	48%	41%	63%
ClickHouse	9%	14%	8%	26%
MongoDB	25%	45%	24%	63%
Others	14%	10%	13%	11%

Companies receiving more than half of their revenues from overseas sales used PostgreSQL more often compared to developers focused primarily on the Russian market. But the popularity of PostgreSQL among the companies with the Russian IT market being the major one is growing very quickly, well in advance of this system popularity among exporters in terms of growth rates. It should be noted that this DBMS holds the leading position in all categories.

The larger the company, the larger its set of DBMSs used. Therefore, all DBMS are mentioned more often by companies with a turnover of more than RUR 375 million (USD 5 million) than by smaller companies.

Development for all DBMSs except Oracle is more often used by companies with a more than 50% export share.

Video communication solutions are divided into technology classes that are not intercompatible - classic videoconferencing, web conferencing and video communicators. The VCS segment is limited - there are not more than ten vendors in the world, the development requires high quality expertise. Creators of web conferencing solutions often sell their less technological and, consequently, low-budget products as VCS. Improperly chosen technology limits customers in functionality, there appear difficulties in integration with the existing infrastructure, implemented on imported solutions of classic videoconferencing.

Boris Popov
Director of Business Development at Vinteo

Vinteo
VIDEO COMMUNICATION CORE

6.1.3. Languages and Programming Tools

In 2020 the wording of the question regarding programming languages has changed dramatically. These languages were no longer divided into basic and other. At the same time, the share of company specialists using programming languages specified in the list was estimated.

Consequently, the popularity of programming languages was determined by other parameters in comparison with the surveys performed in previous years. For this reason the results obtained in 2020 regarding this popularity cannot be correlated with the data of surveys performed in previous years.

The question of programming tools was completely excluded from the questionnaire based on the recommendation of experts who have rendered assistance during this questionnaire development. They considered that information about the popularity of these tools is not of great interest to companies.

As a result, there was only one question about programming tools in the survey, and it was formulated as follows: "What percentage (approximately) of your company's specialists use the following programming languages?". The results of surveys performed prior to introduction

of corresponding changes in the questionnaire in 2020 are presented below (after conducting the analysis of the data obtained during the last survey).

According to the results of the survey performed in 2021 the distribution of places in the rating of the most popular programming languages by the share of employees using a specific programming language did not change over the year. Even the indicator for rating turned out to be almost the same in all languages as in 2020. However, the rating expanded to include the Kotlin and Swift languages (the number of ranked languages changed from 8 to 10). As a result of

Most popular programming languages in Russian software companies (data of surveys performed in 2021-2022)

		Percentage of employees using this programming language		Percentage of surveyed companies using this programming language	
		survey of 2021	survey of 2022	survey of 2021	survey of 2022
1	Java	21.4%	25.6%	52.8%	50.9%
2	JavaScript	16.2%	21.2%	65.6%	72.3%
3	C#	17.9%	13.9%	49.5%	44.1%
4	C++	14.5%	9.0%	55.7%	48.0%
5	Python	6.3%	8.4%	49.0%	58.2%
6	Kotlin	4.1%	6.4%	26.8%	25.4%
7	PHP	5.3%	5.2%	44.3%	36.7%
8	C	6.0%	4.3%	28.3%	22.6%
9	Swift	1.8%	4.0%	20.1%	20.3%
10	Visual Basic .NET	1.7%	2.1%	10.4%	12.4%

Travel tech is at a high level today: we see powerful digital platforms on the market that solve the most complex tasks of planning, budgeting, organizing business processes, control, analytics and online travel reporting. Such platforms help quickly solve the problems of booking tickets, hotels, transfers, even in urgent and multitasking conditions; provide for the use of new payment methods, including cases when a client has to travel outside Russia. Today, companies can carry out business trips comfortably, safely for employees and businesses, while reducing operational and financial costs, as well as administrative burden due to the use of technology.

Anatoly Kuryumov
CEO of Raketa

these two languages addition, Microsoft's Visual Basic .NET was pushed from 8th to 10th place.

Java took the lead in the main rating in 2019 (even before changing the questionnaire) and in terms of the share of employees using this programming language, it ranked first both in 2020 and 2021. However, JavaScript was the leader in terms of the number of references among surveyed companies in the last two years (with a significant lead from the rest).

In 2022 Java and JavaScript strengthened their leading positions, C #, C++, C languages started to lose their popularity, and Swift and Kotlin, the newcomers to the rating, continued their way up.

In addition to main 10 programming languages the respondents also named 17 other languages used, which were mentioned by 33% of surveyed companies. Most often respondents mentioned Go (5.1% of surveyed companies, with 3.8% a year earlier); Delphi (2,8%); Ruby (2,8%); Golang (2,8%); 1C (2.3%); SQL (2,3%); Scala (1,7%); Typescript (1,7%). The rest languages were mentioned 1-2 times (ABAP (2), Erlang (2), Objective-C (2), Flutter (2), Goland, Clarion, CSS, LUA, SmaLL).

The data of the survey performed by RUSSOFT can be compared with the results of other studies. In summer 2020 JetBrains has completed its fourth annual software development ecosystem study. Based on the results of this study JetBrains decided to find out how Russian programmers differ from their foreign colleagues. 20 thousand programmers from 18 countries were interviewed, among which 2.5 thousand respondents were from Russia.

According to JetBrains in 2019 Python bypassed Java in the list of the most

used languages both in Russia and in the world. However, the majority of respondents still were always choosing Java as the main programming language. PHP was forced out from the list of top five most commonly used languages in the world by TypeScript and C++, while in Russia PHP was still in the 4th place.

Top 5 programming languages for the whole world: JavaScript (70.6%), Python (56.1%), Java (55.6%), TypeScript (28.5%), C++ (27.6%); for Russia: JavaScript (62.8%), Python (46.8%), Java (36.5%), PHP (24.5%), TypeScript (23.1%).

A similar picture was observed in the answers regarding languages in the category of "additional" programming languages: new languages are more attractive to Russian developers. They learn Go and Kotlin more often, and they learn Python, Java, TypeScript and PHP less often. Top 5 languages that respondents have begun or continued to learn over the past 12 months (data of 2020): in the world – Python (31%), JavaScript (26%), Java (22%), TypeScript (20%), Go (18%); in Russia – JavaScript (24%), Python (23%), Go (22%), Kotlin (18%), Java (15%).

Go and Kotlin lead the world list of programming languages that respondents plan to switch to. The list is the same in Russia, with the only difference that Kotlin holds the first place.

Some programming languages are no longer used at all. However, the need for the capability to program these languages may arise. In April 2020 it became known that several US states unsuccessfully searched for specialists in the COBOL programming language to update the software used in the employment system – this system ceased to cope with the load due to an increase in the number of

unemployed against the background of the coronavirus pandemic.

At the same time the Fortran programming language developed in 1957 is experiencing a sharp surge in popularity. In the TIOBE rating Fortran was in the last 50th place in summer 2020, but by April 2021 it was on the 20th place. Despite its venerable age, Fortran continues to develop and is still used in various fields – its most current version was released in the end of 2018.

Tasks have arisen in 2021-2022 related to the creation of a safe development environment independent from foreign solutions. At least, publications on these have appeared in media.

In February 2022 it became known that the Federal Service for Technical and

Export Control plans to create by 2024 a unified environment for the development of safe domestic software, thanks to which a set of tools for such software development will be provided for Russian software developers.

In the end of 2021 "Gazprom Dobycha Astrakhan" announced that it had transferred key systems to the Java runtime environment developed by Bellsoft, the Russian developer, abandoning Oracle Java.

In April 2022 CFT and Bellsoft companies announced a start of technological partnership and the compatibility of their products. The "CFT-Bank" banking information complex can operate on the domestic Libercat Java application server with Bellsoft Java SE runtime environment. The use of this software

stack will allow credit institutions to implement plans for import substitution of software, to avoid operational and technological risks, and also to comply with regulatory requirements for critical information infrastructures (CII).

In March 2022 Atlassian, an Australian software developer for software development management, announced that it was suspending the sale of all its new software in Russia due to the situation in Ukraine. Atlassian's development framework includes products such as Jira, Confluence, Bitbucket. The company also suspends existing licenses granted to a number of Russian state organizations and individual corporate clients. As a result, Russian developers of programming tools have another window of opportunity.
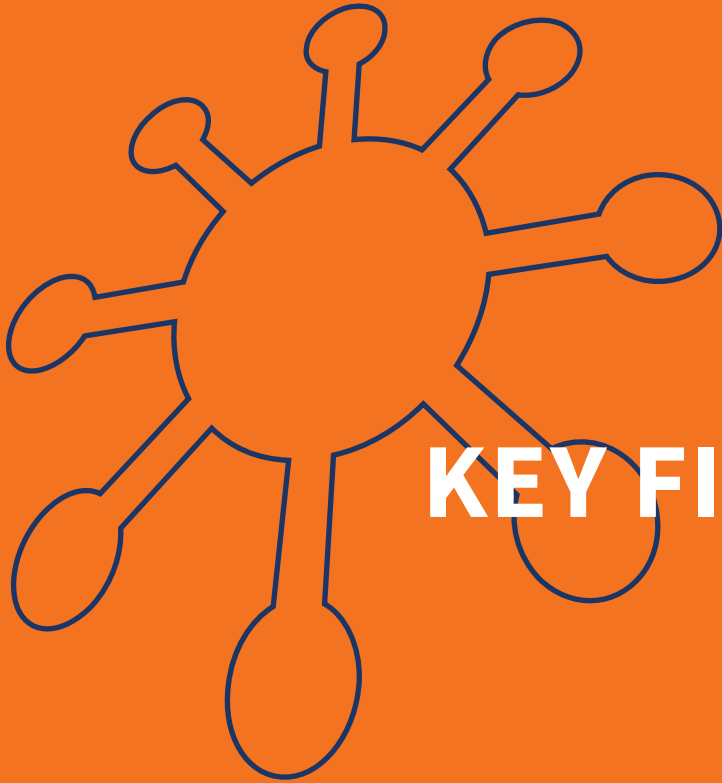
KEY FINDINGS

Economic indicators

According to RUSSOFT, in Russia, there are at least 4.5 thousand sustainable software companies (without startups that do not have regular income). The number of software companies annually grow by about 2.5–4%. At least 2.5 thousand enterprises conduct foreign economic activity.

Since 2017, the number of newly established companies has been steadily growing at the level of 6–7% per year.

In 2021, in Russia, total turnover of software industry enterprises amounted to ₽1,56 trillion, having increased by 19%. Revenues from foreign sales also increased by 19% in ruble terms (up to ₽742 billion) or by 17% in US dollar terms (up to $10.07 billion). Sales in the domestic market similarly increased – by 19%, up to ₽815 billion.

At the end of 2021, service companies' total turnover in ruble terms increased by 17.3% (domestic sales – by 22.2%, foreign sales – by 10.2%). During last years, service companies' sales in the domestic market grew faster than in foreign ones.

Total turnover of product companies grew a little more – by 20% (domestic sales – by 18%, foreign sales – by 23.1%). Thus, the share of service companies in total turnover of all Russian software companies slightly decreased. At the end of 2021, it amounted to 36.7%. Product companies account for 57.8%. Another 5.5% were provided by foreign companies' development centers.

At the end of 2021, depending on the business model, foreign sales were distributed as follows: product companies – 51.65% (in the previous year, it was 49.7%), service companies – 36.75% (39.3%), foreign companies' development centers – 11.6% (11%). At the end of 2020, the share of product companies and development centers also slightly increased, while the share of service companies decreased. Over the past 2 years, changes in this distribution occurred as a result of some shift of service companies to the domestic market, transfer of a number of Russian service companies to foreign jurisdictions, and serious investments in foreign companies' software development centers located in Russia.

In 2020, during the pandemic, the share of companies with growing turnover decreased, which was expected in conditions of crisis. But for the software industry as a whole, the crisis was not as serious as one might assume, therefore reduction in the share of growing companies was small. At the end of 2021, there were more growing companies than a year earlier: the share of the companies increased from 62.6% to 67.8%.

Meanwhile, 63.5% of the surveyed companies increased their turnover by more than 10%, 26.4% of companies – by more than 30%, 10.8% – by more than 50%, 4.7% – by more than 100%.

The share of foreign sales of software companies in all Russian exports of goods and services after the increase in 2020 from 1.7% to 2.3% decreased in 2021 to 1.8%. Given the small share of IT exports in the country's total exports, these fluctuations are due to the dynamics of main revenues from Russian exports. If in 2020, energy exports declined, then in 2021, it grew because of sharp increase in oil prices, which led to growth in all exports by 44.4%.

If we consider only the service exports, the share of software and its development-related services (both cover the concept of exporting computer services) in the total volume of service exports increased in 2020 from 13.1% to 18.3%, and in 2021, it slightly decreased to 18.1%.

Taking into account the primary and secondary anti-Russian sanctions, in 2022, total foreign sales of Russian software companies are probable to be below the level of the previous year. At the same time, domestic software companies' sales in the home market will increase by at least 15–20% in ruble terms. Thus, despite relocation of exporters' sales centers to neighboring countries and significant staff losses because of independent departure of specialists abroad, total turnover of the industry enterprises will not crucially fall, but will increase by 5–10% in ruble terms.

Russian IT Market

According to IDC, in 2021, the entire Russian IT market amounted to $32.6 billion, having increased by 21% (in rubles, the increase made 23.5%, up to ₽2,40 trillion). Thus, the market volume recovered to the level of 2013. According to RUSSOFT, with the same growth as that specified in the IDC report, the market volume amounted to $41.3 billion (₽3,04 trillion).

In 2021, according to IDC, the Russian software market increased by 13% in dollar terms up to $4.04 billion, and by 15.4% in ruble terms, up to ₽298 billion. RUSSOFT considers the software market together with sales of custom development services, having fairly accurate data on Russian software companies' sales in the domestic market. Taking into account the fact that foreign companies' sales amounted to at least $2 billion in 2021, the total market size, according to RUSSOFT, reached $12.06 billion, with the increase of 16% over the year (in rubles, the increase made 18.5%, up to ₽889 billion).

Investments

Total volume of investments in the software industry amounted in 2021 to ₽232 billion ($3.15 billion), which is 2.4 times more than in 2020. The need for investments was satisfied by 58%. This figure also increased significantly, compared to 2020, when it was 37%.

In 2021, external sources of financing account for 26.4% of all investments (in the previous year, it was 22%). These sources provided in 2021 ₽61 billion ($0.83 billion) in absolute values, which is 2.9 times more than in 2020.

The volume of investments in the software industry increased because

of significantly expanding the range of enterprises that invested their own funds or attracted external ones – from 31% in 2020 to 51.5% in 2021 (% of all software development companies surveyed by RUSSOFT). The share of companies with attracted external financing increased even more – from 7% to 21%. At the same time, each company on average also significantly increased its own investments – from ₽22 million to ₽52 million (external investments – from ₽4.5 million to ₽13.6 million).

The multiple growth of investments suggests that in 2021, the investment boom started, the beginning of which could be noticed even when summing up the results of 2020.

In their forecasts for 2022, about the same number of software companies (the same share) that actually attracted investments in 2021, indicated that they have investment plans. If we assume that all the forecasts will be implemented, then the total investment in 2022 should grow by 60%, and external financing – by 214%.

On the one hand, the need for investment most likely increased: there were both many urgent tasks related to import substitution, and the need for reorienting to new markets because of Western countries' markets closing for Russian companies. On the other hand, several months were spent on urgently adjusting the development strategy in conditions of the radically changed situation in the Russian and foreign markets. Nevertheless, it is still worth taking into account the companies' forecasts in terms of investments, since the survey was conducted within the first months after the SVO in Ukraine started, which means that respondents should already have taken into consideration high uncertainty of the situation, reflecting it in their forecasts.

Geography of business

As for forecasts of companies that did not have in 2021 export revenues at all, 26.3% of them (almost 9% of all enterprises surveyed) intend to enter a foreign market in 2022. For these companies, the most attractive markets are those of neighboring countries (15.8% of all companies without export income in 2021), South and East Asia (10.5%), Middle East (10.5%).

The results of 2021 do not prove the trend observed over the years, according to which surveyed companies that managed to gain a foothold in foreign markets have indicators no worse than companies that had not previously worked outside Russia and neighboring countries: companies with the export share of less than 25% increased turnover by 21.4%, with the export share of less than 50% – by 22.5%, and with the export share of more than 50% – by 14.6%.

However, significant group of successful exporters could not participate in the 2022 survey because of the critical situation caused by imposing primary and secondary sanctions on them. Since all software enterprises' exports and sales in the domestic market grew in 2021 equally, it can be argued that the focus on exports provided no less growth than the focus on operation in the domestic market.

As for 2022, it can be assumed that the best growth indicators will be had by companies with the relatively low share of exports. On the one hand, the domestic market attractiveness has increased due to stimulating import substitution, and Russian software exporters have serious problems in Western countries' markets, on the other hand, but it is impossible to quickly reorient to other foreign markets.

In the last 4 years (2018–2021), software developers better managed to expand their businesses by entering foreign markets. This phenomenon is not affected either by fluctuations in the ruble exchange rate against the dollar exchange rate, or by the pandemic.

The approximate distribution of all sales in 2021 by macro-regions is as follows: Russia – 51–53%, Neighboring countries – 8–10%, USA and Canada – 13–15%, Europe (without Russia and neighboring countries) – 12–13%, South and East Asia – 5–7%, South and Central America – 2.5–3%, Africa – about 1%, Australia – about 1%, Middle East – 3–5%.

In 2022, only 1.8% of the surveyed companies have planned to start or resume operation in the US market in the current (in relation to the survey) year. This indicator has decreased by almost 4 times, which cannot be explained in any way by changes in the structure of the array of surveyed companies (it could have caused the decrease by maximum 1.5 times). The attitude towards promising outlook of the European market (without Russia and neighboring countries) also worsened, but the fall in the respective indicator was still less than for the United States – from 7.8% to 3.0%.

In 2022, the share of those wishing to enter new markets in South and East Asia noticeably increased. If we consider the plans relevant only for the current year in respect of the survey, then the indicator has increased from 5.3% to 9.6% (compared to 2021). Growth in interest in the Indian market is especially large: the share of those wishing to enter it increased from 2.4% to 7.2%. Attractiveness of South and Central America has also grown (the respective indicator has increased from 4.9% to 7.8%), the same can be argued for Middle East (from 4.4% to 8.4%).

Ensuring technological sovereignty (import substitution)

The analysis of public communications directly related to the import substitution process indicates considerable growth in attention to it on the part of the government, developers, state bodies and corporations, which occurred in 2021. In 2022, after the start of the SVO in Ukraine, this activity increased even more: the number of reports on Russian clients' sift to Russian software, as well as on decisions of the government (other state bodies) in the field of import substitution

has doubled. Analysts, system integrators, consultants, distributors have got much more interested in the topic of import substitution.

In 2021, sales of Russian software companies in the domestic software market again increased more than this market itself grew, which is one of signs that the import substitution process has accelerated.

Business Conditions

The list of events and state bodies' decisions adopted in relation to the IT industry in the past two years indicates that the state began to pay more attention to the high-tech sector of the Russian economy. If until 2015, inclusive, in this list, there were 1, 2 or 3 items for each year, then in 2016 and 2017 – already 7 such decisions, in 2018 – 14, and in 2019 – 16. In 2020, there was sharp growth – to 65. However, it cannot be said that significance of news decreased. Rather, it even increased. In 2021, the flow of relevant reports turned out to be as large as a year earlier – 66. Approximately the same number of decisions to be important for the IT industry can be expected in 2022 (for less than 8 months – 43 reports).

In the first months of 2022, almost 46% of the surveyed by the RUSSOFT Association of Russian software companies rated state support in the IT sector at the federal level as "good". Though, 16% are still very dissatisfied with it (the rating is "poor"). Software developers' attitude towards state support continues to improve in 2022. When compared with results of the similar survey in 2021, the proportion of "good" ratings increased from 43.4% to 45.8%, while the proportion of "bad" ratings decreased from 19.3% to 16.0%. The change over the year is not so substantial, but it is important that the increase in average score has been happening over the past decade, reaching its maximum in 2022.

Most often, the "good" rating of state support in the IT sector in the first

months of 2022 was explained as "the industry was paid decent attention". This or similar comment came from 45.5% of companies that positively evaluate state support. Preferential taxation was noted by 19.7%. Receiving grants and subsidies was awarded with high rating by 9.1% of respondents (almost 2 times more respondents mentioned this support measure than in 2021). Deferrals from the army and preferential mortgages for IT professionals are approved by 7.6% of respondents. The same number of respondents mentioned preferential lending and stimulating purchases of Russian software. For 1.5%, it turned out to be important that the pressure experienced from various inspections by supervisory authorities has reduced.

The possibility of widespread use of remote mode in the field of software development has been proven. Judging by the software companies surveyed, on average, 36% of the personnel work remotely. If one extrapolates findings of the survey to the entire software industry, then it will turn out that about 42% (a year earlier it was 55%) works in remote mode.

Although, developers working in office are still needed. They either themselves, for various reasons, do not want to work remotely (for example, there are no conditions for this), or the development process requires control from management or the customer, or the team works more efficiently while in the same room. Comparing findings of the surveys over the past two years indicates that, if necessary, at least 13% of the staff can be shifted to remote operation, but this shift is quite undesirable for companies or for software developers themselves.

In 2022, clear reduction in the share of remote operation for IT specialists has happened. Though, the return to office mode of some employees occurred in almost all categories of companies, but unevenly. The largest reduction in the share of the remote mode occurred in those companies that develop software

products, have their turnover of less than ₽375 million and the export share of less than 50%, are located outside of Moscow and Saint Petersburg.

Russia's positions in world ratings

Studying representation of Russia as a whole, as well as Russian cities and companies in various ratings, reports by analysts, foreign English-language media, has got almost irrelevant after starting the SVO in Ukraine. Until the beginning of 2022, there was some bias among rating writers, foreign analysts and journalists, though they still noted certain Russian achievements, and this more or less favored promotion of solutions created by high-tech companies in Russia, or development of the infrastructure. After starting the SVO in Ukraine, one cannot count on any impartiality, even fractional one, in representation of Russia abroad.

The problem of impartiality of global ratings is determined not only by the attitude towards Russia. In 2022, many ratings have got pointless, as minimal impartiality became impossible. For example, it has become impossible to positively assess conditions for doing business in the United States and the EU because of unprecedented political pressure exerted on the companies. Moreover, not only foreign (Chinese, Russian), but also local companies operating in the markets of America and Europe began to experience pressing on the part of politicians. The situation is aggravated by uncertainty of the boundaries of what is permitted. Rating writers do not risk to objectively assess conditions for Russian companies to do business in Western countries, as they, apparently, fear political and economic pressure. If one adapts to Western politicians, there will be no confidence in the ratings built, and then all the ratings themselves have got worthless. Perhaps for this reason, the World Bank stopped publishing the Doing Business rating.

Human resources

At the end of 2021, in Russia, there were at least 720 thousand employees to be directly involved in the software development process (in software companies, these employees are considered core specialists). The increase in their number for the year amounted to about 12%, the same as in 2020.

As of the end of 2021, at least 225 thousand core technical specialists worked in Russian software companies. However, at least 10 thousand of them were outside the country, working in these companies' development centers abroad. Consequently, about 215 thousand software developers worked directly in the companies in Russia as of the end of 2021, which is 12% more than at the end of 2020.

Results of 2021 indicate stabilization of staff turnover at the level of about 12–13%. Compared to the previous year, in 2021, this indicator decreased, though very insignificantly.

The survey of respondents in 2022 did not reveal growth in the share of companies, for which employees' migration abroad is a problem. On the contrary, the percentage of companies that chose the answer "There is no problem for our company" has slightly increased (from 66% in 2021 to 77% in 2022). Nevertheless, due to companies that stopped working in Russia (of course, they did not participate in the survey), the staff outflow abroad sharply increased. According to the results of the first half of 2022, Russian software companies lost collectively 9–13 thousand core specialists because of their departure abroad. If one adds freelancers, software developers employed in enterprises of other industries and government agencies, this figure will increase to 20.5 thousand at most. All in all, losses for IT specialists amounted to 30–40 thousand people, as of July 2022.

Given all the difficulties and problems, in the first half of 2022, the total staff of the companies surveyed, as expected, increased by 5.5%. For companies with no export income in 2021, this growth will be 9.8%.

According to the results of 2021, the wages in dollar terms increased by 14.4%, which made it possible to come close to the level of 2013. So far, software developers' income has been still below this level by almost 4%, but if in 2022, the average annual dollar exchange rate happens noticeably lower than in 2021, the level of 2013 will be overcome and, most likely, it will be done with margin. At the same time, over the past decade, the average wages in US dollars in the global labor market grew (in some years, the increase was by 5–10%). Consequently, competitiveness of Russian custom development remains quite high.

In 2021, the average wages increased in 77% of the surveyed software companies, reduced – in 1.3%, unchanged – in 21.7% (in 2020, there was approximately the same distribution: growth – in 74%, reduction – in 2.3%, unchanged – in 23.7%).

By the beginning of 2021, the average wages in the Russian software industry increased to ₽119 thousand, and by the beginning of 2022 – to ₽139 thousand.

The total need of the software industry for the additional number of specialists who speak foreign languages is estimated in 2022 as about 9 thousand people, of which almost 7 thousand people must speak English fluently. The second most popular language is Chinese. The need for Chinese is less than for English, but in previous years the second place was confidently occupied by German. German takes not even the 3rd, but the 4th place, losing also to Spanish. Most likely, this is due to the increasing interest in the market of Latin America, in which almost everywhere (except for Brazil) the official language is Spanish.

The rating of languages that are advisable for software promotion specialists to speak is almost the same as the rating of foreign languages required for technical specialists. There is only one significant difference: German took the 5th place, behind Arabic.

Technologies

According to the 2022 survey, 79% of the surveyed companies develop solutions for GNU Linux and Windows operating systems. However, if you compare all Linux-based operating systems with the entire Windows family, then Linux will have a clear advantage – 88% versus 79%.

If we consider development for different operating systems in man-hours, then the share of Windows will be only 28.2%, and Linux – 48.8%. After Microsoft announced its work cessation in the Russian market, it is easy to assume that by the end of 2022, the share of Windows will have decreased even more, and the share of Linux will have increased. Most likely, both changes will be more significant than in 2021.

In 2022, developers began to design applications more intensively only for Oracle DBMS (from 10% to 16.2%) and PostgreSQL (from 38.5% to 47.1%). For other database management systems, there is reduction. PostgreSQL has further strengthened its leadership in the DBMS ranking in popularity among developers.
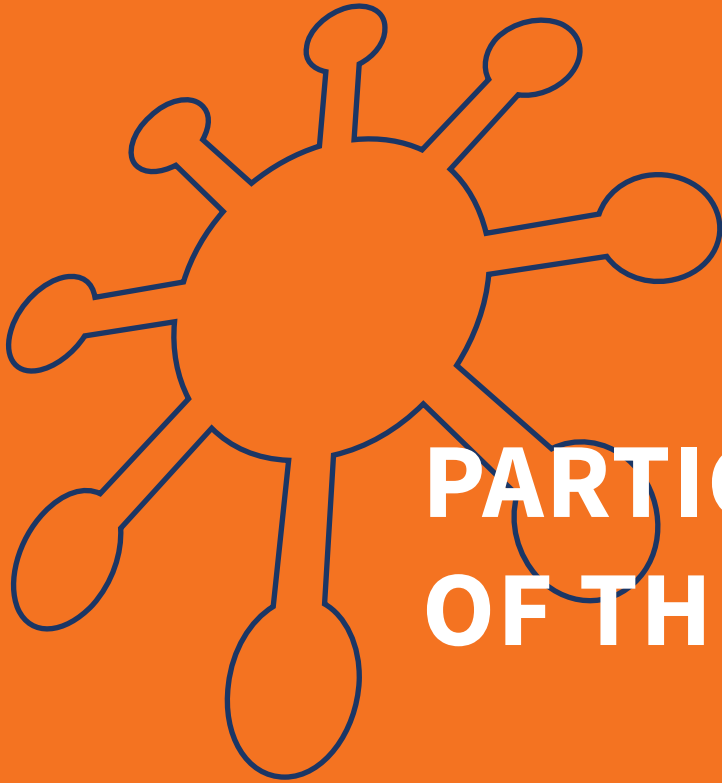
PARTICIPANTS OF THE SURVEY

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
2Nova Interactive	Saint-Petersburg	2nova.ru	hello@2nova.ru	(812) 318-4085	Custom software development	
7bits	Omsk	7bits.it			Custom software development	AR & VR Development; Artificial Intelligence; Big Data & BI; IoT; Smart City
A7 Systems	Saint-Petersburg	a7systems.ru	info@a7systems.ru	(812) 603-7137	Development of programming tools and database	Artificial Intelligence; Big Data & BI; IoT; Smart City
Across Engineering	Moscow	across.ru	info@across.ru	(495) 517-8033	Custom software development	
Active Business Consult / VS Robotics	Moscow	vsrobotics.ru	pr@vsrobotics.ru	(495) 136-5182	Embedded software (equipment, devices)	Artificial Intelligence; Big Data & BI
ALAN-IT	Yaroslavl	alan-it.ru	info@alan-it.ru	(485) 237-0303	Development of own analytical services	Artificial Intelligence; Big Data & BI; IoT; Smart City
Alee Software	Saint-Petersburg	alee.ru	info@alee.ru	(812) 309-7859	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	
ALPOM	Saint-Petersburg	alpom.ru	inbox@alpom.ru	(921) 745-5069	Custom software development; Embedded software (equipment, devices)	
Altcraft	Ryazan	altcraft.com	contact@altcraft.com	(491) 290-1004	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI
ALT-SOFT	Saint-Petersburg	altsoft.spb.ru	altsoft@altsoft.spb.ru	(921) 956-7961	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence
Alvion Europe	Sevastopol	alvioneurope.ru	info@alvioneurope.ru	(978) 767-9890	Custom software development; Website designing	Big Data & BI; IoT; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Angels IT	Voronezh	angelsit.ru	it@angelsit.ru	(473) 255-5007	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Embedded software (equipment, devices)	AR & VR Development; Artificial Intelligence; IoT; Smart City
Arax Group	Moscow	araxgroup.ru	info@araxgroup.ru	(495) 504-8263	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Blockchain Technology
Arcadia	Saint-Petersburg	softwarecountry.com	info @softwarecountry.com	(812) 610-5955	Custom software development	Artificial Intelligence; Big Data & BI
A-Real Consalting	Yaroslavl	xserver.a-real.ru	hello@a-real.ru	(800)555-9297	Information security solutions	Artificial Intelligence
Artezio	Moscow	artezio.com	welcome@artezio.com	(495) 981-0531	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology
ASys Soft	Moscow	asys.ru	asys2007@mail.ru	(929) 539-7815	Custom software development	
ATM	Moscow	атм.москва	mail@atm.msk.ru	(499) 490-2207	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI; IoT; Smart City
Auriga	**Moscow**	**auriga.com**	**pr@auriga.com**	**(495) 713-9900**	**Custom software development**	**Embedded and system-level development; Big Data; ML; IoT**

Established in 1990, Auriga is one of the top 100 leading outsourcing software R&D providers worldwide. Headquartered in the U.S., with 600+ employees located across seven development centers and operating 13+ embedded testing R&D labs, Auriga delivers 100+ projects yearly.
We offer custom software development, product maintenance, re-engineering and porting, integration, testing and test automation services for medical device, automobile and construction tools manufacturers, industrial automation and power management companies, consumer electronics, retail & logistics, software vendors (ISVs), semiconductors and hardware manufacturers (OEMs), like Chrysler, Draeger Medical, nVent and others.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
AV Soft	Moscow	avsw.ru	konkurs@avsw.ru	(495) 988-9225	Information security solutions	Artificial Intelligence; Big Data & BI; IoT; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
AVS Consulting	Moscow	avsconsulting.ru	avs@avsconsulting.ru	(925) 999-3071	Custom software development, Website designing	AR & VR Development; Artificial Intelligence; Big Data & BI; Blockchain Technology; Smart City
AXELOT	Moscow	axelot.ru	a.dolgikh@axelot.ru	(495) 961-2609	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
Axilon	Moscow	axilon.ru	info@axilon.ru	(916) 815-3499	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other), Custom software development	Big Data & BI
BOBDAY	Krasnodar	bobday.ru	info@bobday.ru	(800) 201-3375	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	Big Data & BI
Brain Systems Group	Saint-Petersburg	brainsystems.ru	zakupki @brainsystems.ru	(800) 555-3107	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
Celsus	Kaluga	celsus.ai	celsus@celsus.ai	(965) 077-7705	Embedded software (equipment, devices)	Artificial Intelligence
CenovikPRO	Moscow region	cenovik.pro	info@cenovik.pro	(495) 215-5248	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
Cerebro	Moscow	cerebrohq.com	info@cerebrohq.com	(499) 110-8234	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	
Citrus	Ioshkar-Ola	citrus-soft.ru	alex@citrus-soft.ru	(987) 702-7147	Website designing	
CodeInside	Penza	codeinside.ru	office@codeinside.ru	(8412) 636-736	Custom software development	Artificial Intelligence; IoT

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
CommuniGate Systems	Moscow	communigate.ru	russia @communigate.ru	(499) 271-3154	Development of unified communications technologies	
Cortex	**Krasnodar**	**cx.technology**	**info@cx.technology**	**(988) 245-9945**	**Custom software development; Scientific researching**	**Artificial Intelligence; Blockchain Technology**

Cortex Technology is an international software group focused on digital commodity trading, agritech, biotech, and digital transformation of state authorities.

Our key practices:

— Digital commodity markets for metals and chemicals, trade platforms integration (Nasdaq, CQG, public blockchains), real-time data exchange, blockchain technologies (custom blockchain, dAps, smart-contracts);

— MedTech and BioTech: end-to-end product lifecycle automation, procurement and contract management, bioinformatics, machine learning for biological and medical data, telemedicine SaaS;

— Incident management in casinos;

— Regional decision support and incident management systems.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Crosstech Solutions Group	Moscow	ct-sg.ru/	info@ct-sg.ru	(495) 741-8864	Information security solutions	Artificial Intelligence; Big Data & BI
CVisionLab	Taganrog	cvisionlab.com	info@cvisionlab.com	(903) 464-7047	Custom software development	Artificial Intelligence
Cyberprotect	Moscow	cyberprotect.ru	info@cyberprotect.ru	(903) 203-2299	Information security solutions	
Data East	Novosibirsk	dataeast.com	support@dataeast.com	(383) 332-0320	Navigation and geographic information systems	Artificial Intelligence; Big Data & BI; Smart City
DDoS-Guard	Rostov-on-Don	ddos-guard.net	info@ddos-guard.net	(495) 215-0387	Information security solutions	Artificial Intelligence
Development Center SAPR "GeoS"	Nizhny Novgorod	k3info.ru	sale@k3info.ru	(831) 435-2539	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Diasoft	**Moscow**	**diasoft.ru**	**pr@diasoft.ru**	**(495) 780-7575, (495) 789-9339**	**Software development for the financial and other industries; custom software development; enterprise resource planning (ERP platform); development of basic software (DBMS, programming tools)**	**Business processes management, visual analytics, Big Data, AI, ML**

Diasoft is one of the largest Russian providers of IT solutions. During its 31-year history, it has accumulated a unique experience in development, implementation and support of comprehensive IT systems for customers from different industries, with the main focus on financial institutions.

Diasoft is recognized as a systemically important company for the Russian information and communications industry. Its products are listed in the Unified Register of Russian Programs for Electronic Computers and Databases, and are recognized by Gartner, IDC, Forrester, BIAN and other global experts.

The company is headquartered in Moscow, has branches in Saint Petersburg, Yaroslavl, Cheboksary, Perm, Novosibirsk, a representative office in Germany and a subsidiary in Vietnam.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Digital Design	Saint-Petersburg	digdes.ru	info@digdes.com	(812) 346-5833	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	Artificial Intelligence; Digital Workplace
DZ SYSTEMS	Moscow	dzsystems.com	sales@dz.ru	(495) 225-7693	Mobile applications; Custom software development	Artificial Intelligence; Big Data & BI; Smart City
Econophysica	Tomsk	econophysica.com	conactus @econophysica.com	(3822) 900-601 ext: 1003	Custom software development; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI; Smart City
EC-Tavrida	Simferopol	ec-tavrida.ru	ec-tavrida@yandex.ru	(978) 780-6700	Custom software development	
Edelink	Saint-Petersburg	edelink.ru	info@edelink.ru	(812) 507-3804	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	PropTech

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
e-legion	Saint-Petersburg	e-legion.ru	anna.krasavtseva @e-legion.com	(981) 844-4060	Mobile applications; Custom software development	Big Data & BI; IoT; Smart City
ErmineSoft ltd.	Novosibirsk	erminesoft.com	denis@erminesoft.ru	(913) 926-2697	Custom software development; Website designing	AR & VR Development; Artificial Intelligence
Etton Grup	Kazan	etton.ru	info@etton.ru	(800) 100-0815	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology; Smart City
Evavision	Ekaterinburg	evavision.tv	sales@evavision.tv		Development of a broadcasting control system for a network of video monitors of a new generation	IoT; Smart City
FAYGROUP	Moscow region	faygroup.ru	info@faygroup.ru	(964) 786-6003	Custom software development	IoT
Fidesys LLC	Moscow	cae-fidesys.com	v.a.levin@mail.ru	(495) 177-3618	Scientific researching; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; IoT; Smart City
FlexSoft	Moscow	flexsoft.com/about	info@flexsoft.com	(495) 788-0325	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI
Fogstream	Khabarovsk	fogstream.ru	org@fogstream.ru	(4212) 909-809	Custom software development	Blockchain Technology; Smart City
Foresight	**Moscow**	**fsight.ru**	**info@fsight.ru**	**(495) 137-5498**	**BI-systems**	**Artificial Intelligence, Big Data & BI, IoT, Smart City**

foresight.

Foresight is one of the largest Russian BI vendors. The company delivers to the market native and mature solutions for data analysis and corporate mobility development – Foresight Analytics Platform and Foresight Mobile Platform.

Foresight Analytics Platform features high performance, supports various data types and their data sources, includes machine learning, big data, modeling and forecasting technologies.

The company has also developed such products as Foresight Budgeting, Foresight Investment Management, and FlyBI used for business analysis on-the-go. Company products are used by companies in corporate, state and banking sectors. The Foresight partner network includes more than 60 Russian IT companies.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Format Koda	**Saint-Petersburg**	**formatkoda.ru**	**info@formatkoda.ru**	**(812) 336-5533**	**Custom software development; Mobile applications**	**Artificial Intelligence, Big Data & BI, IoT, Smart City**

FormatKoda is a premier provider of software engineering, software enablement, and digital transformation advisory services.

The company leverages its agile technological excellence to efficiently deliver complex projects in retail digitalization, web content management & eCommerce, healthcare IT & real world evidence and data, machine learning and enterprise data management. Software engineering services include Mobile and IoT Dev, Test Automation, and Big Data Implementation.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise
GDC Services	Usady town (Tatarstan)	icl-services.com	pr@icl-services.com	(800) 333-9870	Custom software development; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	AR & VR Development; Artificial Intelligence; Big Data & BI; IoT
Gektor	Moscow	gektorstroi.ru	support@gektorstroi.ru	(495) 510-1545	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
GEOCAD plus	Novosibirsk	geocad.ru	info@geocad.ru	(383) 352-1333	Navigation and geographic information systems	AR & VR Development; Smart City
Geoscan Group	Saint-Petersburg	geoscan.aero	info@geoscan.aero	(812) 363-3387	Professional unmanned technologies; Embedded software (equipment, devices)	AR & VR Development; Artificial Intelligence; IoT
Global Rus Trade	Moscow	globalrustrade.com/ru	info@globalrustrade.com	(495) 256-2625	International trade Marketplace	
GLOLIME LTD	Saint-Petersburg	glolime.ru	info@glolime.com	(812) 334-9384	Specialized tablet computers and development of a management system for enterprises and organizations on their basis	IoT
GS Labs	Saint-Petersburg	gs-labs.ru	alexey.goilo@gs-labs.ru	(911) 000-3347	Integrated solutions for the formation of ecosystems for the creation and delivery of digital products based on proprietary technologies	IoT; Smart City
HARMAN Connected Services	Nizhny Novgorod	harman.ru, harman.com	Olga.Sheinfeld@harman.com	(905) 664-1155	Custom software development	AR & VR Development; Artificial Intelligence; Big Data & BI; IoT; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
IBS InfiniSoft	**Moscow**	**ibs-infinisoft.ru**	**ymaksimenko@ibs.ru; info@ibs-infinisoft.ru**	**(495) 967-8080; (495) 967-8081**	**Custom software development; Mobile applications; Website designing**	

IBS InfiniSoft is a development hub of IBS group of companies with global 30 years' experience and big number of projects providing technology solutions and drive business change for customers in Russia and abroad. We focus on the business landscape with industry knowledge and digital capabilities, combining strategy and results-driven software development.
IBS InfiniSoft operates efficiently with an agile workforce of 1000+ developers and other IT specialists. It combines a unique mixture of development excellence and deep industry expertise, helping our clients innovate in the areas of State administration, Automotive industry, Financial services, Healthcare, Media and Telecommunications, Retail, Oil and Gas, Energy, and other industries. We offer software, SAP, mobile, 1C and web development, as well as UI/UX design, UX-research, architecture & consulting services.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Ideas World	Simferopol	iw-group.pro	info@iw-group.pro	(800) 301-0762	Custom software development; Mobile applications	
INEC-IT	Moscow	inec.ru	support@inec.ru	(495) 786-2230	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
InetPartners	Moscow	callpy.com	business @inetpartners.ru	(926) 613-4870	Custom software development	Big Data & BI; IoT
Infinity Video Soft	Tomsk	videograce.ru	contact @videograce.com	(903) 953-3424	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	
INFOPRO	Moscow	info-pro.ru	post@info-pro.ru	(800) 600-2401	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT; Smart City
Information Systems and Services	**Novosibirsk**	**isands.ru**	**info@isands.ru**	**(800) 775-1986**	**Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)**	**Artificial Intelligence; Big Data & BI; IoT; Smart City**

Information Systems and Services, LLC is a company that uses its own low-code development platform IS.PROMETHEUS to create applications quickly and easily. The company's products are based on microservices architecture to show solid performance in handling the growing number of requests and are used by a variety of large enterprises.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
INFORM-TEKHNIKA	Moscow	minicom.ru	inf@infotek.ru	(495) 662-7321	Developer and manufacturer of modern means of communication	
Inline Group	Voronezh	inlinegroup-c.ru	contacs @inlinegroup-c.ru	(910) 749-8328	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	AR & VR Development
Innotech	**Moscow**	**inno.tech**	**info@inno.tech**	**(800) 500-3333**	**Custom software development**	**Artificial Intelligence; Big Data & BI**

INNOTECH

Innotech Group (part of Group T1) is a fast-growing high-tech IT company. Since 2020 we have been providing cutting edge software solutions for business digitalization. Innotech Group builds partnerships with leading companies in the financial sector, offering them comprehensive solutions for front and back offices, modern fintech products and big data systems. Moreover, Innotech Group carries out custom-made technological projects of any complexity, helping its clients on the path of digital transformation.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Inostudio Solutions	Taganrog	inostudio.com	russoft@inostudio.com	(8634) 320-318	Custom software development	AR & VR Development; Artificial Intelligence
INOVENTICA Technologies	Moscow	inoventica-tech.ru	info@inoventica-tech.ru	(495) 646-7308	Information security solutions	
Inreco LAN	Vladimir	inrecolan.com	sergey.pyatigorskiy @inrecolan.com	(492) 244-4090	Custom software development	
Integral	Saint-Petersburg	integral.ru	eco@integral.ru	(812) 740-1100	Stationary software for environmental calculations	
ISGneuro	Moscow	isgneuro.com	info@isgneuro.com	(495) 232-2233	Development, support and development of our own product line of analytical software	Artificial Intelligence; Big Data & BI; IoT
iSpring	Ioshkar-Ola	ispring.com	buh@ispring.ru, valentina.bulygina @ispring.com	(960) 099-0074	Online Training Software	
ISPsystem	Irkutsk	ispsystem.ru	e.lavrenteva @ispsystem.com	(963) 305-0563	Embedded software (equipment, devices); Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools); Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
IT Pro	Moscow	biqube.ru	dp@itprocomp.ru	(952) 056-1199	Custom software development	Artificial Intelligence; Big Data & BI
ITB LLC	Saint-Petersburg	itb.spb.ru	manager@itb.spb.ru	(812) 335-0145	Information security solutions	
ITC Solutions	Sevastopol	itcsolutions.ru	dm@itcsolutions.ru	(989) 836-9939	Outsourcing/ outstaff architecture, development, system and business analysis, software testing	
ITConstruct	Novosibirsk	itconstruct.ru	office@itconstruct.ru	(383) 375-1277	Website designing	
ITPS	Perm	itps.com	info@itps-russia.ru	(495) 660-8181	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI; IoT
IVA Technologies (IVKS)	Innopolis	iva-tech.ru	info@iva-tech.ru	(495) 134-6677	Developers of innovative IT solutions for building a modern digital infostructure	Artificial Intelligence
IZZZIO	Moscow	izzz.io/ru	info@izzz.io	(905) 520-3080	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT
KAMIS	Saint-Petersburg	kamis.ru	info@kamis.ru	(812) 274-3522	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Smart City
KODEKS	Saint-Petersburg	kodeks.ru	nishonov@kodeks.ru	(812) 740-7887	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	AR & VR Development; Artificial Intelligence
LANIT-TERCOM	Saint-Petersburg	lanit-tercom.ru	contact @lanit-tercom.com	(812) 922-2091	Custom software development	AR & VR Development; Artificial Intelligence; Big Data & BI; Blockchain Technology; Smart City
Lartech	Saint-Petersburg	lar.tech	info@lar.tech	(812) 339-4501	Embedded software (equipment, devices)	IoT; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Lexema	Ufa	lexema.ru	info@lexema.ru	(347) 284-7000	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
Lotsiya	Moscow	loodsen.ru	welcome@loodsen.ru	(495) 730-2023	Custom software development; Mobile applications; Website designing	Big Data & BI
Luxms Group	Saint-Petersburg	luxmsbi.com	sales@luxmsbi.com	(812) 974-7403	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	Artificial Intelligence; Big Data & BI; IoT; Smart City
Makves	Moscow	makves.ru	marketing@makves.ru	(495) 150-5406	Information security solutions	
MATSBKT-SEZ	Moscow	interpolymech.com	nnevskaya@global-rc.ru	(916) 609-0790	Custom software development; Embedded software (equipment, devices)	AR & VR Development; Artificial Intelligence; IoT
Megaputer Intelligence	Moscow	megaputer.ru	info@megaputer.ru	(499) 753-0129	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	Artificial Intelligence; Big Data & BI
Microolap Technologies	Tatarstan	microolap.ru	formal@microolap.ru	(926) 326-9277	Information security solutions	Network Traffic Analysis (NTA)
Monolit-Info	Saint-Petersburg	monolit.com	alex@monolit.com	(921) 937-8542	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	Big Data & BI
Motiware	Belgorod	motiw.ru	office@motiw.ru	(472) 278-0000	Custom software development; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Moy Klass	Ekaterinburg	moyklass.com	info@moyklass.com	(495) 108-5239	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI
New space	Moscow	newspacecorporation.com	info @newspacecorporation.com	(928) 165-3302	Custom software development; Website designing	Big Data & BI; Blockchain Technology; IoT; Smart City
Nexign	Saint-Petersburg	nexign.com/ru	Yekaterina.Petrova @nexign.com	(812) 326-1299	BSS solution provider	IoT
NitrosData	Moscow	nitrosdata.ru	info@nitrosbase.com	(495) 101-4324		Big Data & BI
NooSoft	Bryansk	noosoft.ru	lv@noosoft.ru	(913) 271-3993	Custom software development	Artificial Intelligence; Big Data & BI
Nord Clan	Ulyanovsk	nordclan.com	welcome @nordclan.com	(499) 404-0943	Custom software development; Mobile applications; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence
NotiSend	Tomsk	notisend.ru			Marketing platform for business	
Novosibirsk Scientific and Technological Center	Novosibirsk	nntc.pro	ematveeva@nntc.pro	(923) 248-2615	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
NTP-DIP	Saint-Petersburg	ntp-dip.ru	dip_zenit@mail.ru	(911) 928-8478	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
OFT	Bryansk	oft32.ru	oft@inbox.ru	(920) 602-3335	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Open Solutions	Penza	osinit.com	info@osinit.com	(800) 250-9669		AR & VR Development; Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT; Smart City
Piter-Soft	Saint-Petersburg	piter-soft.ru	info@piter-soft.ru	(812) 333-0860	Custom software development	
POWWWER	Novosibirsk	powwwer.io	a.mitasov@powwwer.io	(383) 318-1043	Custom software development; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Blockchain Technology; IoT
Project	Moscow	project-llc.ru	sdmitriy@project-llc.ru	(985) 890-0000	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
PROMT	Saint-Petersburg	promt.ru	julia.epiphantseva @promt.ru	(812) 655-0350	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
Prostorlab	Moscow	prostorlab.com	korolev@enersys.ru	(926) 296-0502	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	IoT; Smart City
PROTEI	Saint-Petersburg	protei.ru	sales@protei.ru	(812) 449-4727	Embedded software (equipment, devices)	Big Data & BI; IoT; Smart City
RAIDIX	Saint-Petersburg	raidix.ru	request@raidix.com	(812) 622-1680	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	Artificial Intelligence; Big Data & BI; IoT; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Raketa	**Moscow**	**raketa.world**	**hello@raketa.travel**	**(925) 655-9007**	**Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)**	**Big Data & BI**

"Raketa" Company is a developer of the digital platform and the mobile application for business trips and expense management. Our solution helps commercial and government companies save up to 30% of business travel budgets and up to 90% of employees' working time, makes the process of organizing business trips and expense management fully digital and automated.

"Raketa" is the winner of the prestigious Buying Business Travel Awards in the Technology category in 2022 and the best Online booking tool in 2018.

The company's offices are located in Moscow, Vladivostok, Yekaterinburg, Novosibirsk, Almaty, Nur-Sultan, Bishkek. The staff has 100 employees. Now we have more than 300 largest companies from Russia and abroad in our portfolio.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
RDTEX	Moscow	rdtex.ru	marketing@rdtex.ru	(495) 995-0999	IT Services	Artificial Intelligence; Big Data & BI; IoT
red_mad_ robot Tomsk	Tomsk	redmadrobot.ru	ee@redmadrobot.com	(909) 542-2169	Custom software development; Website designing; Mobile applications	Blockchain Technology; IoT
Redline	Tomsk	redlg.ru	info@redlg.ru	(999) 619-7912	Website designing; Mobile applications	IoT
Reksoft	Moscow	reksoft.ru	info@reksoft.ru	(495) 926-1771	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT; Smart City
Relex	Voronezh	relex.ru	market@relex.ru	(473) 271-1711	Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	Big Data & BI
Renga	Saint-Petersburg	rengabim.com	info@rengabim.com	(812) 703-1011	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
RNDSOFT	Rostov-on-Don	rnds.pro	es@rnds.pro		Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	Big Data & BI; Blockchain Technology; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
RTC ARGUS	Saint-Petersburg	argustelecom.ru	t.stakanova @argustelecom.ru	(921) 781-2612	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI
S.C.A.T	Krasnodar	skat-vending.com	info@skat-vending.com	(918) 199-3891	Custom software development	Artificial Intelligence
SatvaSpace	Tver	satvaspace.com	s.abdulova @satvaspace.com	(921) 655-6958	Custom software development	Artificial Intelligence; IoT
SDI SOFT	Moscow	sdisoft.ru	info@sdisoft.ru	(499) 495-1042	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	NRI – Network Resource Inventory
SearchInform	**Moscow**	**searchinform.ru**	**info@searchinform.ru**	**(495) 721-8406**	**Information security solutions**	**Artificial Intelligence; Big Data & BI**

SEARCHINFORM
INFORMATION SECURITY

SearchInform is a leading Russian developer of information security solutions. The company's list of products includes instruments for complex internal threats protection: SearchInform Risk Monitor, SearchInform DLP, SearchInform SIEM, SearchInform FileAuditor, SearchInform ProfileCenter and TimeInformer as well as information security services using its own products.

SearchInform products are suitable for companies of all industries, where data is stored, processed and transferred. The competence of the company is confirmed by a perpetual license from the Center for Licensing, Certification and Protection of State Secrets of the Federal Security Service of the Russian Federation, as well as by licenses from the Federal Service for Technical and Export Control of Russia.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Secret Technologies	Moscow	secretgroup.ru	info@secretgroup.ru	(495) 109-2950	Information security solutions	
SETERE	**Saint-Petersburg**	**setere.com**	**info@setere.com**	**(812) 921-0977**	**Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools); Custom software development**	**Blockchain Technology**

SECURITY
TECHNOLOGY RESEARCH

SETERE (LLC "TBI") is a software development company for users of domestic operating systems based on LINUX. At the moment, the company has released two of its own products: a software package for the rapid deployment of remote workstations "ISU Terminal" and "SETERE OCR optical text recognition system".

SETERE is also engaged in import substitution projects, carries out complex deliveries of software and equipment of its partners.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Sibedge	Tomsk	sibedge.com	contacts@sibedge.com	(382) 270-1841	Custom software development	Artificial Intelligence; IoT

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
SIGMA messaging	Saint-Petersburg	sigmasms.ru	integration @sigmasms.ru	(904) 615-4608	Content provider for A2P text and multimedia messaging	
SimbirSoft	**Ulyanovsk**	**simbirsoft.com**	**request @simbirsoft.com**	**(800) 200-9924**	**Custom software development**	**Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT**

SimbirSoft

SimbirSoft provides custom software development and testing services. Since 2001, we have created more than 1000 IT products for business growth and development in fintech, retail, healthcare, logistics, industry, etc. We develop IT solutions for work automation, high-load systems, mobile apps, machine learning and data science systems for customers from Russia, Europe and the USA. We provide all services with our own staff of 1300 employees.

SimbirSoft is listed among the largest IT companies in Russia and in the Software 500 global rating. Growth rates and service quality are confirmed by international awards and Global Outsourcing 100, RAEX, RUSSOFT AWARD, CNews, Tadviser, and Tagline ratings.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
SIMETRA	Saint-Petersburg	simetragroup.ru	moscow @simetragroup.ru	(812) 702-1335	Custom software development; Navigation and geographic information systems; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Smart City; Big Data & BI; Artificial Intelligence
Simtech Development	**Ulyanovsk**	**simtechdev.ru**	**sales@simtechdev.org**	**(800) 550-8510**	**Custom software development**	

simtech
DEVELOPMENT

Simtech Development is a developer of eCom solutions for the transitioning of business to a new level of digitalization.

We have been converting sales to online for more than 17 years. Since then, we have implemented more than 5,000 projects, including the launch of highly loaded online stores and marketplaces "from scratch", as well as modifications of existing complex eCom projects. We work with corporations, financial and trading companies, manufacturing enterprises and local businesses.

We work in the in-house development format, implementing projects by specialists of our own.

Furthermore, our operation is in accordance with the requirements of the international standard ISO 9001:2015.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
SKB Kontur	Ekaterinburg	kontur.ru	pr@skbkontur.ru	(800) 500-5080	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)	Artificial Intelligence; Big Data & BI

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
SkyDNS	Ekaterinburg	skydns.ru		(812) 385-7421	Information security solutions	Big Data & BI
Smart Analytics	Perm	sm-analytics. com.ru	eugenia.shadrina @sm-analytics.com	(964) 190-3412	Custom software development	Big Data & BI
Smart Design	Saint-Petersburg	smddev.com	vitaly.tishkov @smddev.com	(921) 932-7150	Custom software development	Artificial Intelligence; Big Data & BI; IoT
Smartilizer Rus	Saint-Petersburg	smartilizer.ru	evgeny.filippov @smartilizer.ru	(921) 323-1370	Custom software development	Artificial Intelligence
SMS-Information technologies	Samara	sms-it.ru	info@sms-it.ru	(846) 205-7900	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	IoT
Soft Company	Moscow	softwarecom.ru	info@softwarecom.ru	(495) 983-0548	Custom software development	Big Data & BI; Blockchain Technology
SoftLab-NSK	Novosibirsk	softlab-nsk.ru	administration @softlab-nsk.com	(383) 363-0462	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other); Custom software development	AR & VR Development
SOLVO	Saint-Petersburg	solvo.ru	sales@solvo.ru	(812) 606-0555	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI
Sopos	Saint-Petersburg	einsur.ru	info@einsur.ru	(812) 507-6780	Custom software development; Tender platform; Health insurance expertise	
SPC KRUG	Penza	krug2000.ru	krug@krug2000.ru	(841) 249-9775	Development of software and hardware complexes and industry solutions in the field of industrial automation	IoT
Speech Technology Center	Saint-Petersburg	speechpro.ru	stc-spb @speechpro.com	(812) 325-8848	Embedded software (equipment, devices)	Artificial Intelligence; Big Data & BI; Smart City
SPHAERA	Moscow	sphaera.ru	info@sphaera.ru	(495) 672-7076	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Big Data & BI; Smart City

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
SSP SOFT	**Moscow**	**ssp-soft.com**	**sales@ssp-soft.com**	**(495) 975-9390**	**Custom software development**	

SSP SOFT is a service company and a reliable IT service provider for the implementation of complex, large-scale business digital projects in banking and financial sector, retail, telecommunications, transport and logistics, power engineering and other areas.

The company was awaded by the «RUSSOFT AWARDS 2021» prize in the category of fast-growing service companies that have made significant progress in the field of software development and IT -services export.

Access to more than 1500 highly qualified specialists, high quality requirements, quick response to customer`s requests and modern management approaches allow SSP SOFT to provide services that meet international standards.

SSP SOFT operates in the Russian Federation, Republic of Belarus, Republic of Kazakhstan and other EAEU countries.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Statanly Technologies LLC	Saint-Petersburg	statanly.com	sergey@statanly.com	(921) 875-2396	Custom software development	Artificial Intelligence; Big Data & BI; Smart City
Supl.biz	Tomsk	supl.biz	info@supl.biz	(800) 600-5831	Services based on our own business platform Supl.biz	Artificial Intelligence
SWDC RTSoft	Moscow	rtsoft.ru	rtsoft@rtsoft.ru	(495) 967-1505	Embedded software (equipment, devices); Custom software development	AR & VR Development; Artificial Intelligence; IoT; Smart City
SWTECNN LLC	Nizhny Novgorod	swtec.group	Artem.Kalachev @swtecnn.com	(960) 173-8444		
Syncretis	Saint-Petersburg	Syncretis.com	info@syncretis.com	(812) 611-0686	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology
T1	Moscow	t1.ru	info@t1.ru	(495) 727-0985	Custom software development; System integration; Consulting	Big Data & BI; IoT
TEAM FORCE	**Moscow**	**teamforce.ru**	**welcome @teamforce.ru**	**(495) 646-8040**	**Custom software development; Mobile applications; Website designing**	**Human capital**

TEAM FORCE is the pioneer of SmartStaffing and the leader of the TEAM FORCE Alliance, where IT teams have been strengthening each other via project-based rearrangement of required competencies since 2008. Our Alliance, as an industry partnership, is focused on solving the challenges of the largest corporate customers.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Technoservice	Moscow	techsrv.ru	info@techsrv.ru	(499) 704-3425	Custom software development	Big Data & BI; IoT; Smart City; AMS (Association Management Software); ESB (enterprise service bus)
TERMIKA	Moscow	olimpoks.ru	info@termika.ru	(495) 956-2101	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	
TLK	Novosibirsk	youlk.ru	info@youlk.ru	(383) 209-3430	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; IoT; Smart City
Tract-Soft	Saint-Petersburg	tract-soft.ru	ns@tract.ru	(812) 490-7799	Embedded software (equipment, devices); System for broadcasting automation and planning the radio content	
Transset	Moscow	transset.ru	inform@transset.ru	(499) 649-4668	Custom software development; Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	Artificial Intelligence; Big Data & BI; IoT; Smart City
TRONIC	Moscow	tronicint.ru	info@tronicint.ru		Supply of technological solutions for the production of microelectronics and relevant IT solutions for various sectors of the economy	Big Data & BI; Smart City
Unlim-Soft	Tyumen	unlim.group/unlim-soft	m.zemlyanoy@unlim.group	(345) 228-5052	Custom software development	Artificial Intelligence; IoT
Usetech	Moscow	usetech.ru	info@usetech.ru	(495) 660-5048	Custom software development	Artificial Intelligence; Big Data & BI; Blockchain Technology; IoT

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas corresponding to global technological trends
Vinteo	**Krasnodar**	**vinteo.ru**	**info@vinteo.ru**	**(800) 333-4016**	**Basic software development (DBCS, OS, office applications, virtualization tools, programming languages and tools)**	

Vinteo is a Russian producer of professional videoconferencing software and endpoints (telepresence) and a provider of video engineering services. The Vinteo products are based on the international ITU-T standards and H.323 and SIP protocols and provide the maximum compatibility with third-party videoconferencing solutions. Vinteo products are used for holding conference calls at the highest government level, organizing national programs on distance education, telemedicine, etc.

The company's developments are included both in the Unified Register of Russian Software and in the official list of analogues recommended by the Russian Ministry of Digital Development, Communications and Mass Media for replacement of popular foreign video communication services.

Company	Head office location	Web	E-mail	Phone	Specialization	Expertise in areas
VR Concept	Moscow	vrconcept.net	info@vrconcept.net	(495) 212-1147	Replicated enterprise (institution) management, document of automation, design and production process systems (ERP, CRM, ECM, EDMS, CAD, APCS and other)	AR & VR Development; Smart City
Web3 Integrator	Moscow	wavesenterprise. com	sales @wavesenterprise.com		Custom software development	Blockchain Technology; IoT
Webpractik Ltd	Rostov-on-Don	webpractik.ru	info@webpractik.ru	(863) 303-2038	Custom software development; Website designing	Artificial Intelligence; Big Data & BI
WESMA	Moscow	wesma.agency	manager@wesma.ru	(495) 118-2474	Website designing	

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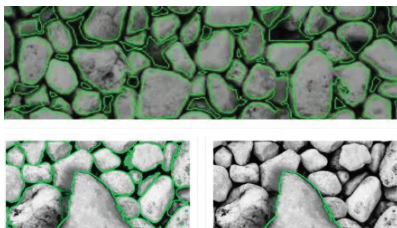
RDetector

SAAS-passenger counting solution

Kit Bot

Corporate HR bot communication automation

ML Sense

ML solution for defining and tracking defects in the conveyor production

Granulometry

Machine vision algorithm for evaluating the particle size distribution of bulk materials and rocks, as well as identifying oversized fractions.

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A neural network-based system that determines the wear and integrity of teeth on various excavator models in real time

Defect management on an assembly line

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