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В СОСТАВЕ ГРУППЫ КОМПАНИЙ АКИГ

11 МЕСТО

среди крупнейших консалтинговых групп России*

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на рынке консультационных услуг

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НАШИ КОМПЕТЕНЦИИ

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Urban Trends

Industrial Policy

Science as Life

The *Wheel of Fortune* summer edition of the Strategy Journal covers the most pressing issues of Russia's economy: the role of science and scientific research in society and business environment, new corporate learning techniques, urban development, and trends in the national industrial policy.

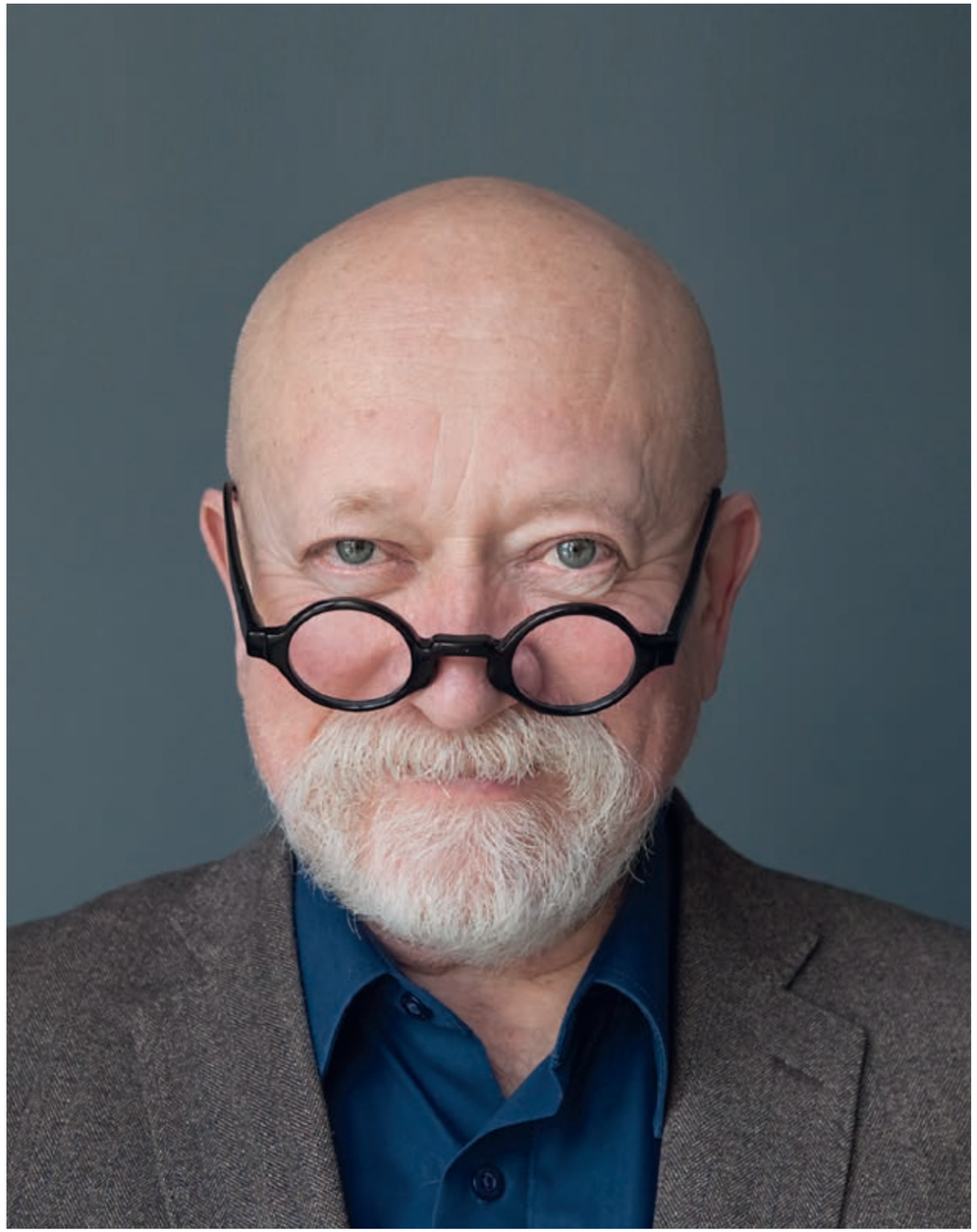
Structurally, the issue contains three thematic modules and includes expert interviews, analytical information, opinion pieces and editorials.

The Urban section deals with agglomeration management, green building, underground space development and the role of the architect in nowadays society.

The Industry section includes core issues of import substitution and industry localization of foreign companies in Russia and vice versa, the export capacity of the Russian economy illustrated by success stories of regional businesses, Russian innovative development projects, as well as aspects of the ICT-fueled digital economy.

The Science section renders exclusive content about the role science plays in the community and its practicability, R&D mission and goals large companies set in strategy development and implementation, advanced corporate learning techniques, and the image of a modern scientist.

Dmitry Mikhailov,
Editor-in-Chief



Inconvenient Profession

The architect's work not just adds to the appearance of a city, but also makes the best conditions for the life of contemporaries and those to come. Unfortunately, today the role of the architect has been relegated to the background and forgotten in some ways. This oblivion began in the fifties, when the famous resolution on elimination of excesses in design and construction was published. President of the Union of Architects of Russia Nikolay Shumakov discusses ways to restore the profession to its former importance, methods to draw young people back and prospects of the architecture in Russia.

You are running several organizations: the Union of Architects of Russia, the Union of Moscow Architects and the Central House of Architects. Besides, you are the chief architect of Metrogiprotrans. How do you juggle these jobs?

My jobs are diverse, and each requires tremendous attention and full commitment. For example, being the chief architect of Metrogiprotrans, I am directly engaged in professional activities. Metrogiprotrans takes practice, development and refreshing of skills, it is an opportunity to prove yourself as an architect, to create and build. My primary duty is the design of transport facilities: bridges, train stations, airports and metro systems. Therefore, I work both underground and above ground. This is my chief function as an architect practitioner.

Also, the unions are a community activity focused to promote the profession. They bear no preference as they represents absolutely different spheres. It is like choosing what I like doing the most, painting or architecture. It is necessary to give yourself up to any business completely — that is what I have chosen. As well, I am surprised at how someone cannot combine several jobs, it is pure and simple. The main thing is to make every effort to develop what you love the most.

You designed objects that soon became new symbols of Moscow: Moscow Metro stations, the Zhivopisny Bridge, the Tolerance Museum, the Moscow Monorail, Vnukovo-1 air terminal. Which object, in your opinion, correlates as much as possible with the architectural landscape of the capital?

My pride and my preference is, of course, the metro.
I have designed the metro all my life, over 40 years at the Metrogiprotrans Institute. Over these years, I have engineered dozens of objects dedicated to the metro.

I interpret the metro as a system of tunnels with sporadic stations. This is the favorite project: an endless line underground. The metro is one of the fundamental urban hub environments for a modern man, and it should be both comfortable, functional and aesthetically meaningful. The metro not just correlates with the architectural landscape of the city, it represents its integral part, one of the principal elements, the frame, and the cornerstone of its lifestyle.

Those cheerful moments when I had a chance to design other objects — Moscow West Port, Vnukovo, the Synagogue, the Museum of Modern Art — were rather uncommon exceptions. For example, originally, we did not intend to design Vnukovo. We were doing an underground railway station for the airport, when an idea of building a new terminal arose. A German company was carrying out the project, but they did not do a great job and, as a result, the commissioning team rejected it. The customer unexpectedly made an offer to Metrogiprotrans, and, of course, we agreed. Our job was to create a multifunctional environment with lots of multipurpose spaces.

The Zhivopisny Bridge faced a comparable situation: our main object was a double-deck tunnel (rail and car) called “The Zvenigorod highway section between MKAD to Marshal Zhukov prospekt”. We were glad to meet the customer’s request and design the bridge, which is now one of the signatures of Moscow.

Today, there is increasingly more talk about urban planning as an architecture domain that unites the city into a single mechanism. Are there any successful urban projects in Russia?

The concept of urban planning is relatively recent, it appeared not more than 3-4 years ago, yet it is poorly understood. For some it is an unknown area, even for the construction and design industry. As a comprehensive studies, urban planning involves all activities, all human capabilities and intelligence.

I would not speak of any significant success in urban studies, especially in Russia. What scares me the most today is inadequate development of new territories. For instance, a city is augmented with a piece of land 2.5 times larger than the city itself. However, urban planning is absent in the territory: unfortunately, there is invasive prefabricated panel construction in the open, and there is no simple, at least poor, master plan of urban development.

This is frustrating, there exist negative examples, though I do not know any positive ones. They exist undercover and will most likely appear in the next 20 years. With no adequate urban planning in Russia, there are people who call themselves urbanists.

I hope that the Moscow housing renovation project will commence the era of urban planning and competent territorial development. To demolish is definitely a good thing; people should have proper housing. These five-story apartment buildings are impossible to live in, they are no place for a modern man, and they are reinforced concrete barracks that steal your joy.

"The concept of urban planning is relatively recent, it appeared not more than 3-4 years ago, yet it is poorly understood. For some it is an unknown area, even for the construction and design industry"

Therefore, they must be torn down, but in a manner to rebuild a district with good and smart architecture, not just to replace a five-story with a nine-story, one panel with another. It is important to make a complex urban project for each demolished group of buildings, for each demolished block. Unfortunately, this issue involves a lot of politics, and politics is not the architect's business.

Honestly, I am convinced that everything that Moscow urban decision makers undertake today is right, Sobyanin's programs are viable, they are a great stepping stone for the future. He is a Siberian and does everything in a Siberian way, in a big way: if he makes up his mind to demolish retail areas, he immediately demolishes them, if he decides to pave roads, he does all of them at once. Likewise, five-story buildings must face demolition without hesitation.

While the country has not yet developed a coherent architectural policy, it is too soon to talk about urban planning. Obviously, we will come to it. I hope that one year from now the updated law "On architectural activities" will be adopted, which will be finalized in accordance with the updated city-planning law. Now this is believed to be one of the main components of the union's work.

The law includes many articles ranging from the self-regulation problems of urban architectural policy and public procurement systems to building a cutting-edge urban environment. But above all, the law should frame the state's attitude to architectural policy in order to put the architect and architecture in charge of creating any architectural object.

Is there any outlook for smart cities in Russia? What world metropolitan areas would you call a case of a real smart city?

Sooner or later, smart cities are will define our future. Once villagers poured into cities, so the progress is relentless. Nevertheless, I believe that all these smart structures provide not for comfort, but rather for self-satisfaction, for laziness, loss of health and common sense.

Now it is more a theoretical aspect in Russia. What will come out of it in the end is a complex, incomprehensible and unpredictable. There are no such examples in our country yet. Perhaps, I would single out Singapore, although this is not a smart city in a general sense, but rather it is an amazing, well-conceived metropolitan area, an absolutely comfortable city for living. It is exceptionally well-planned: urban housing groups, integral park territories, greeneries, environmentally conscious education. The most well-planned, comfortable, urban development is, of course, Hong Kong, a symbol of superurbanism. Should we live the same way is another point. All these philosophical questions have no answer.

Moscow has always had its own way, true or not, it is hard to say, but Moscow will not follow the example of Hong Kong, Singapore or another city. Moscow architectural development is rather peculiar and interesting: endless and uninterrupted chaos and fusion of styles — this is what makes Moscow fascinating. Moscow has a great architectural future.

You said that the role of the architect has become less significant and there is need for revival of the profession. Is the union dealing with this situation?

Unfortunately, this is the case. The role of the architect in contemporary Russian society is underestimated, the architect's profession has become "inconvenient". A builder, investor and customer always want the same thing: build cheap and faster and sell dear. The architect, on the contrary, pursues value, and this always entails an increased price, increased construction time and other problems. We seem to stand on the opposite sides of the barricades. Yet, I firmly believe that Russia deserves glorious architecture; a person cannot develop and thrive in a poor, gray, miserable environment.

The union is, in fact, the only organization in Russia that struggles for distinction, revival and support for the profession, for promoting the architect's role, takes part in the architectural legislation. NOPRIZ, the Russian Academy of Architecture and Building Sciences, deals with this too; however, the union makes the most contribution to develop this profession. Some regional associations are ineffective to the point that they face extinction, and this is distressing. There are instances when regional unions of poor regions are in their prime, and the other way around. For example, in Kazan, a city of excellent architecture, significant cash injections, which has developed incredibly over the past 20 years, the Union of Kazan Architects has virtually disintegrated. This is heartbreaking, since the profession will stay underrated without well-developed regional societies of architects.

«Роль зодчего в современном российском обществе недооценена, профессия архитектора «неудобна»

Once you noted in an interview that the Union of Architects of Russia is aging, half of the staff are of retirement age. Do you intend to attract young people? Is there a future for young architects?

The Union of Architects of Russia is a federal association present in all regions of the country. What is self-evident, problems are the same all around. Sadly, the unions are aging and young people do not generally see how membership in the union will benefit their future career. Overall, the union consolidates all the architects, engages in the architectural enactment and advocates the interests of the profession at all levels.

Nevertheless, we strongly attract young people. If we do not do it, the union will go under. A year ago, we added 300 people to our ranks, most of them are young professionals. We have always placed a bet on young people, as they breed many talented architects. Few universities in Russia graduate architects, which aggravates the situation. The only major institution today that specializes in architecture is Moscow Institute of Architecture. There are architectural departments in Moscow State University of Civil Engineering and some other institutions. There is considerable measure of rivalry in Moscow Institute of Architecture now, but this is due to shortage of universities, not because the profession is popular. It is only natural. This is not a problem. I reckon that the main thing is that there is demand for architecture. Thus, the education will be fine, and people will choose this career. Our biggest sorrow now is the lack of architectural policy in Russia. The society does not understand that architecture should be well done, of high quality, that it must be a concern of professionals. Now all that is done in this regard is unconscious, it brings a horde of panel-type houses to cities, and, unluckily, this turns into an architectural face of Russia.

What is the union up to now, what are your immediate plans?

Go by leaps and bounds into the bright future. We build plans for a year ahead. There will be many architecture events to promote the profession. For example, on 5-7 October we will hold the 25th anniversary architecture festival Zodchestvo 2017 in Gostiny Dvor. It will feature the first all-Russian architectural show contest for the best interior. On 13-17 September Nizhny Novgorod will host the Eco Shore festival and the international contest for the best Strelka (Nizhny Novgorod district) development concept. Regional unions regularly hold festivals too. The Union of Architects of Russia has proved its viability, this year it celebrates 150 years.

Sky City Chronicles

One of Europe's largest business centers, the focus of Moscow business life and a new hallmark was developed atop of what before the Russian Revolution used to be a stone quarry, warehouse and industrial zone. Throughout the construction, it sparked mixed reactions from city managers, economists, businessmen, art historians and architects. The Strategy Journal learned how the construction of Moscow City began, what the megaproject's initial plan was and what it evolved into.

At the beginning of Perestroika, when Russians were not familiar with crimson suit jackets, finger-think chains and the "new Russians" cliché, the honored architect of Russia Boris Tkhor proposed to the Moscow authorities to develop the most expensive business district in the country.

The then Government of Moscow was progressive-minded. The Iron Curtain was lifted following adoption of the law "On the Procedure for Entering and Leaving the USSR", and Moscow was full of hope for a new life and a new dignified place among world capitals. Although the change of the political system, unstable economy and ideological shifts disfavored the emergence of a "city in the clouds", Westernization played a decisive role to make it happen. The aspirations of the Moscow authorities turned out to be stronger than the Soviet conservatism, which had already become obsolete, and even the city's lack of involvement in commercial development was not an obstacle. In 1992, the most ambitious, expensive and controversial project was launched.

From a quarry to the sky city

The skyscraper complex with the tallest building in Europe has grown where the famous Dorogomilovsky limestone quarries used to be to provide for the white-stone Moscow Kremlin. This part of the city resided beyond pre-revolutionary Moscow and was used only for rock mining. "For a long time the land parcel had remained an underdeveloped part of the urban environment," explains Moscow historian and architecture historian Denis Romodin in an interview with RBC. In the Soviet era, the area was reserved for a public or exhibition space.

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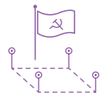
"For example, according to the 1935 Moscow General Plan, the territory was to become a part of the Krasnopresnensky Park due to its expansion. It lodged a bid to host Expo 67, which eventually took place in Montreal," says the honored architect of Russia, corresponding member of the Russian Academy of Arts Sergey Tkachenko in a Modern Moscow Atlas lecture.



In the Soviet era, the area was reserved for a public or exhibition space

Warehouses, industrial zones and an eponymous cemetery that disappeared in 1939 are the historical foundation of the Moscow City district. As territorial development began, the selected area lacked the infrastructure and communications required for the successful operation of a giant financial center. City architects proposed to place the complex away from the downtown, to Kubinka, since it provided the transport accessibility. "Some opinions assert that the construction site was selected irrationally. Indeed, it made more sense to build the complex closer to the Moscow Ring Road," says president of the Union of Architects of Russia Nikolay Shumakov.

Scientists also agreed with the architects. In 2009, geography professor of Moscow State University Georgy Rychagov spoke in a Komsomolskaya Pravda interview about the risk of building such monumental structures over former quarries and limestone deposits.

“The then authorities did not take into account the world practice of building large-scale financial out of downtowns, thus, clearing city spaces, creating new business districts, and sometimes entire satellite towns,” says Artem Komarov, the board chairman at EcoHolding.

The impression was that the construction site was selected randomly, which brought a natural question on transport accessibility for tens of thousands of people to get to work daily, because the access was available through a few bottlenecks. “I believe that the Moscow City district, which has been built almost in the center of the city, is a town-planning mistake; the skyscrapers seem to be locked in stone. The city has created additional 300,000 jobs. It is a city within a city, without proper infrastructure, which means that it creates more traffic problems. It is important to think about ways to reduce traffic congestion,” said Sergey Sobyanin, assuming office as Mayor of Moscow in 2010. The city mayors of the early 1990s had a more upbeat attitude towards city development and the idea of building the business district was welcomed enthusiastically. In 1992, the management company OJSC City was established, thereby preparing the construction site and laying the communications. 4.5 million sq m of residential and office areas, 22 high-rise buildings, the central wedding palace, the Government of Moscow, a huge water park and a recreation park were supposed to cover more than 60 hectares. The Moscow City district was to become a pioneer on the way to modern development of the city. “The City is the first significant step towards the polycentric development of the city, first stated in the 1971 General Plan,” says the chief architect of Moscow Sergey Kuznetsov.

“The financial center was planned to be divided into 20 sections, with a park within the central section and an underground parking underneath it. Highway exit and entrance ramps would go to the parking areas beneath every high-rise building,” says Sergey Tkachenko, Director of Research and Design Institute for the Moscow General Plan in 2004-2011. As the group of architects led by Boris Tkhor sees it, the skyscraper complex was supposed to have a U-shaped arrangement around a green zone; the buildings would spiral up, culminating with the most impressive central Russia Tower.

Rejected Russia Tower

Sadly, ambitions and money ran out after three years. In 1995, the construction of the business district paused for as long as ten years, and instead of skyscrapers, excavation pits stayed open for a long period. “The biggest pit in Europe” it was dubbed by grim journalists of the Perestroika era. The economic situation of the 1990s in Russia did not help the successful implementation of the project, even more so the profits. After all, the most ambitious unfinished project in Russia, conceived as a counterpart of La Défense in Paris and the Canary Wharf in London, was finished not so much for beauty as for the most profitable use of the expensive plot of land.

For people who think in terms of figures and financial strategies, the building of the largest financial center in Russia could mean only one thing: profit, profit and more profit. In practice, instead of profits the financial center made losses for a long time, calling for permanent investment. Well-balanced investment and efficient use of the premises and the right choice of the construction site could turn the City into a gold mine. However, the emergence of Russia's first high-rise district on a patch of wasteland encouraged by high-ranking officials did not contribute to the profitability of the project. The losses forced investors out of the project, which in turn provoked funding problems, and escalated further on: suspended construction, postponed completion date.

Change of funding source prevented the timely implementation of the project and the coherent urban planning concept developed by Boris Tkhor. Initially, the state should sponsor the business district. However, the economic crisis made adjustments, and the funding burden was placed on other investors, each of whom in turn fulfilled its own ambitions through the project.

“Investors who joined the project and purchased the land, began to increase the area and height of the respective skyscrapers out of economic and, possibly, vain reasons. So, no trace was left of the integrated approach to building a high-rise district,” reminded Sergey Tkachenko, a former director of Research and Design Institute for the Moscow General Plan, in an RBC interview. Initially, the engineering facilities and networks were redundant by one and a half times the complex required. However, this reserve of engineering networks was not enough to satisfy the appetite of investors; increasing the floor count resulted in the shortage of communications.

Another reason the original view of the City changed was excessive freedom the architects enjoyed while planning the buildings. The projects involved architects from around the globe, including the world star Erick van Egeraat, the creator of City of Capitals Tower and Mercury Tower (the latter tower — the third tallest in Europe — is included in the list of cultural and historical heritage of Russia).

The architects implemented ideas distinct from the complex integrated design. They took into account the ambitious outlook of investors and the ongoing economic crisis, which ultimately resulted in the failure of the original architectural project. In the end, the 612-meter Russia Tower (more than 0.5 million sq m) by Sir Norman Foster incurred the biggest loss.

Russia Tower was supposed to be the pivotal building of the entire complex that would compound all the skyscrapers into a single structure. First, the tower project dropped out multiple floors: it was designed

to be the first building in Europe to exceed the 100 floors barrier, however, the 2000s crisis pushed the skyscraper down to 200 meters height. As a result, in 2008, economic hardship forced Shalva Chigirinsky's company — the main developer — to abandon the project completely.

The financial center lost one more skyscraper, the Moscow Government building. As an ex-director director of Research and Design Institute for the Moscow General Plan Sergey Tkachenko explained: the city government could not persuade investors to lend it half of the area. Therefore, the project was suspended. The M-shaped government building will be replaced with Grand Tower, 25 meters shorter, with the completion date to be up to 2018.

The project proposed a greenbelt around. However, due to financial reasons, instead of green infrastructure, the Afimall shopping and entertainment center was built. The initial concept, proposed by the chief architect Boris Tkhor, today relates only to the Tower 2000 and the Bagration Bridge; all other buildings are completely different from the original design for the integrated development of the district.

Good fences make good neighbors

In those years, journalists were by all account not the only ones who criticized and defamed the City, since zealous guardians of the old Moscow staged protests and pickets, tried to tell the authorities that the skyscrapers district "had literally disfigured" the historical appearance of the city. The architectural component probably became the biggest sticking point that divided the urban community in two.

The Moscow City district neighboring with the UNESCO world heritage sites, the Kremlin and Cathedral square, inflames a controversy in favor of the integral architectural ensemble of the city. The oldest part of the capital how had a 300-meter tall neighbor five kilometers away, and aesthetic persons criticized the modern architecture eclipsing

The 612-meter
Russia Tower
incurred the
biggest loss

the historical panorama of Moscow, ever perceived as its signature features. However, if we explore the history of Moscow architecture, an obvious conclusion springs up: the complex fits perfectly and does not distort the panorama. Throughout the history, Moscow architecture underwent constant transformation: Baroque, Russian classicism, eclecticism, Art Nouveau, Stalin's Empire style, post-Soviet modernism. Cutting edge architecture and deconstructivism seem like a natural progression.

"Moscow should have had such a facility since long ago. In my opinion, it perfectly fits into the architectural ensemble of the capital. Moscow architectural development is rather peculiar and interesting: endless and uninterrupted chaos and fusion of styles — this is what makes Moscow fascinating," says Nikolay Shumakov, the chief architect of Metrogiprotrans.

Still, Moscow is not an untouchable outdoor exhibition; every historical period leaves its trace in it. Stalin's Empire style is far behind. The modern life asks for ease and comfort. Megacities will inevitably rise, and Moscow is no exception. In the 1990s, such a palace of glass and steel seemed to be something inconceivable. It was an impossible dream, an arrogant challenge to the obsolete utmost monotony both in public life and in architecture. The investment of tens of years and billions of dollars generated a highway bypassing the district with seven flyovers. In 2014, Delovoy Tsentr metro station opened. Erected in transport isolation and survived four economic crises, the international financial center has been overgrown with roads, bridges, overpasses and metro stations.

Right now, the skyscrapers provide offices, congress halls, exhibition spaces, galleries, restaurants, hotels, entertainment and shopping malls, small retail spaces. The towers commissioned after 2011 are more than 90% occupied. Today, it offers some of the most expensive apartments in the country ($8,000-24,000 per square meter) and the tallest skyscraper in Europe, Federation Tower. For the sake of justice, it is worth noting that the pessimism of the early 1990s did not take place. One of the most impressive and controversial Moscow districts, which changed the urban landscape radically, became a rightful participant in the business life of the capital.

Taking Nature's Course

According to the UN, the urban populace will increase by 2.5 billion people by 2050. Today, more than half of the world's population lives in cities, 74.2% in Russia. The spontaneous growth of megacities has devastating consequences for the planet's ecology: cities are one of the primary sources of environmental pollution today.

Experts, addressing the problems of global warming, have concluded that city buildings all over the world consume around 40% of all primary energy, 67% of electricity, 40% of all raw materials and 14% of all drinking water, and produce 35% of carbon dioxide emissions and half of all solid domestic waste. According to a McKinsey research, buildings in Russia accounts for approximately 36% of all energy consumed and 30% of greenhouse gases emitted, half of which are residential emissions. According to the UN, by 2030 the growing world population will require 35% more food, 40% more water and 50% more energy.

To improve the ecological state, world governments began to come up with new approaches to the design and production of buildings. These approaches later became known as green building. "The global construction industry clearly moves towards buildings that can generate own-use energy from a variety of sources and use it as never before. I could call them autonomous. They will have new energy balances," says Guy Eames, the chairman of Green Building Council Russia, at the round table discussion "Green building as a way to improve the environmental situation".

The American LEED and the British BREEAM dominate the global environmental standards for construction. More than ten voluntary certification systems for construction exist today, however, LEED and BREEAM have firmly entered global construction certification systems, including in Russia. Moreover, not so long ago a project started to fully Russify these standards. "International standards are the result of investment in hundreds of thousands of man-hours, it is the use of a variety of modern techniques, and it is the study of the energy balance of a building. The standards reflect the efficiency of heating, cooling, lighting, water and air supply. These standards address issues such as human health inside the building, the air quality," explains Guy Eames.

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Green technologies reduce household energy consumption by 25% and water consumption by 30%. They reduce both construction and domestic waste production. Construction of a standard 2,500 sq m house generates over two tons of construction waste. This amount can be reduced by 90% using green standards.

The principle of green building saves energy and resources, promotes reuse of materials, reduces the emission of greenhouse gases and toxic substances, decreases the environmental impact and gives an opportunity to live in conditions that are more comfortable and in harmony with the environment. According to financial experts, green building, as one of the pillars of sustainable development, will also be a chance for the world economy to escape the crisis. Green buildings will diminish the need for traditional hydrocarbon fuels.

Advanced economies designate the introduction of environmental standards among their main architecture trends. "Green building is one of the world's fastest growing industries," notes Guy Eames. According to the US analytical organization McGraw-Hill, about 70% of US development companies implement environmentally sound technology in most of their projects. Construction of integrated eco-cities is increasingly popular around the globe in recent years; good examples are Masdar City in the United Arab Emirates and Houguan Lake in China.

The United States and the EU announced that by 2020 all buildings must meet new energy standards in order to consume as much energy as they can generate during the year. Many global companies, such as IKEA, have decided that they will use the building engineer technology, that is to say, they will switch over to renewable energy sources completely. Google has pledged to cover all energy consumption by green sources by the end of 2018.

Unfortunately, green building is immature in Russia, perhaps due to insufficient state support, both legislative and executive. Poor awareness and lack of understanding of green building, relatively low cost of energy resources, low motivation to use eco-technologies, as opposed to developed countries — all this poses an obstacle. Building codes and regulations that are in line with environmental principles could be of help here. "Environmental standards represent more tools for green building. It is very

difficult to adopt a standard that would immediately start to work in the market," says Guy Eames, a spokesperson of Green Building Council Russia.

Nevertheless, beside attempts by others agencies, the Ministry of Natural Resources and Environment widely introduces green standards by publishing guidelines on the application of environmental compliance criteria in construction. In 2009, Dmitry Medvedev called energy efficiency and energy savings a national priority. At the same time, significant improvements began to take place: laws on energy saving and improving energy efficiency, on technical regulation, and on the safety of buildings and structures were adopted. These acts oblige to reduce energy consumption by 40% by 2020. In 2010, the Federal Agency for Technical Regulation and Metrology introduced the national system for voluntary real estate certification "Green Standards". Having initiated the Russian Sustainable Architecture and Building Council, the Union of Architects of Russia also promotes this policy. The signing of the Paris Agreement by Russia, the accession to the Montreal Protocol on Substances That Deplete the Ozone Layer — all this indicates that environmental principles play a significant role in the national development strategy.

Today, four buildings in Russia comply with the LEED standard and more than 40 are waiting for evaluation, the Green Building Council Russia report noted. The Hypercube in Skolkovo an illustrative example of energy efficiency and proper use of green technologies. A single system manages the facility communications; the building is usually illuminated thanks to light catchers installed on the roof, the water collection system provides up to 50% of the water supply, the wastewater is treated and reused.

"The territory of Skolkovo is a prototype of a big laboratory for designing new urban planning and construction. Housing designed using LEED technologies (three clusters: the first includes 40 cottages, the second, 80 townhouses and cottages, and the third offers apartments in five-story "smart" buildings) meets the main goal — electricity, heat and water management. We managed to reduce water consumption in the clusters 20% below the standard, primarily due to using "smart" house technology," says Irina Mosheva, the Director for Project Management of Residential Areas and Social Infrastructure at ODAS Skolkovo, at the round table discussion "Green building as a way to improve the environmental situation". The transport infrastructure of Skolkovo develops in accordance with green building principles. "Internal combustion vehicles will be banned from Skolkovo in 2020. Only hybrid or electric transport will be permitted around the premises. There are park-and-ride stations, so the infrastructure is well-planned," adds Irina Mosheva.

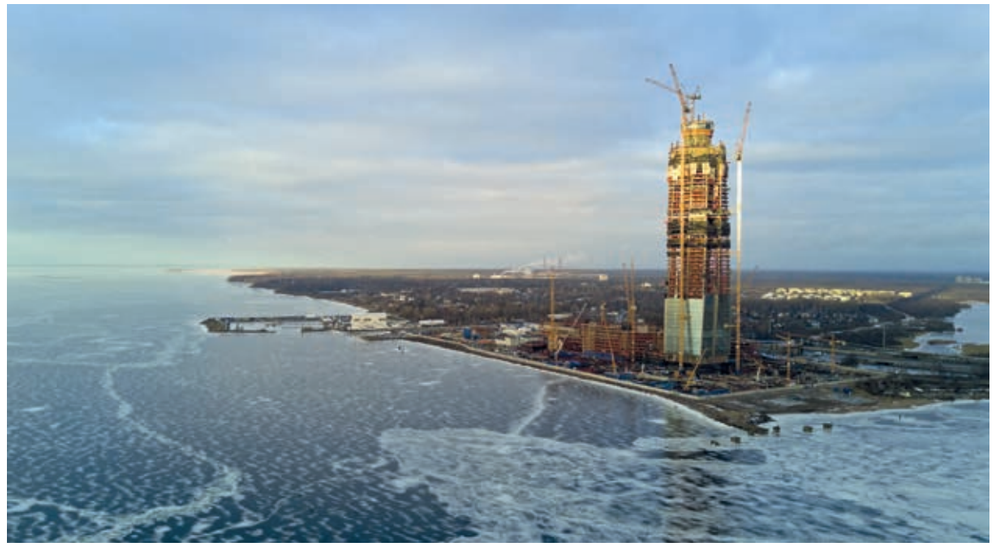
The tallest European skyscraper Federation Tower is another example of superb building technology. Panoramic UV-protective windows along with light-adjusting detectors that sense the crowd and natural light ensure comfortable indoor temperature. Energy recovery system heats up fresh air from the outside, and if any change in temperature occurs, the system redirects heat or cold excess to other parts of the building.

Ten objects in Russia are BREEAM-certified. In particular, the first certified commercial facility is Ducat Place III in Moscow, and the first certified residential complex is Triumph Park in St. Petersburg. Green technologies save their residents up to 40% electricity, 25% water and 25% heating.

The 2014 Olympics was a fine incentive for the development of green technologies in Russia. "All the green building in Russia began in 2009, when preparations for the Olympics started. The introduction of international green building standards began," says Guy Eames, the chairman of Green Building Council Russia.

The Bolshoy Ice Dome, the Fisht Stadium in Sochi and the Otkritie Arena in Moscow are the first green sports venues in Russia. Adler and Olympic Park are the first railway stations that use solar energy. Berlin Central Station was used as a pattern for the Adler railway station. The arrival and departure boards of the Berlin Central Station use energy produced by solar panels. Similarly, this technology is applied in the Adler station, where solar energy enables to produce two-thirds of hot water, thus saving 5 million rubles a year on heating and water supply. The most green and innovative building in Russia, as developers expect, will be Gazprom-owned public and business complex Lakhta-Center that will be built in 2018 in St. Petersburg. All existing eco-technologies that enable energy consumption by 40% were used during construction.

"Russia's green building industry most certainly grows, however, there are many yet unresolved problems, including the aftermath of the recent crises. Nevertheless, I am sure the society that promotes ecological awareness has a great future. Today there work architects and engineers in Russia who use wood materials in construction, as well as renewable energy and composite technology," remarks Guy Eames. Literally, ten years ago, such buildings seemed like futuristic visions. Today they are a necessity, one of the main tools to preserve the planetary ecology by reducing the negative impact on the environment.



Urban Environment

How does the crisis of globalization influence urban development? How to combine modern requirements to the comfortable living environment with business infrastructure and measures to ensure the safety of people? What is the role of an individual in the urban environmental evolution? Experts of the Institute of Geography RAS and Saint Petersburg State University shared their opinions on these issues.

The leading researcher of the Institute of Geography RAS, Olga Vendina

The impact of the crisis of globalization on urban development

An important role is assigned to the theory of global cities that spread its influence beyond national territories and attracted people flows, knowledge and capital. On the contrary, the crisis of globalization is often associated with political domination over economics, return to the idea of borders, and considerable significance of the state. Constantly changing relations between cities and states caused similar changes in the tendencies of urban development. Globalization imposed new standards of urban life and management that we have to master in a short period of time in order not to lag behind the modern standards, but at the same time this puts forward a request for diversity. It was easy to carry out the first task. However, explosive growth of cultural pluralism shocked them. Growing differences in society due to migration and technological change greatly exceeded the ability of ordinary citizens to adapt to them. This affected such key pillars of urban governance, as a local identity and the urban community. As a result, a request for administrative methods to solve intracity problems and government intervention has increased, especially in Russian and European cities. However, reaction is different. The priority of municipal administration is not a novelty, but a habitual reality for us that is considered by the majority of the population this way: “The authorities have to ensure...” It is somewhat paradoxical that an active promotion of new standards of urban life with the help of administrative methods led to democratization of urban life and the participation of the population in decision-making. As for European countries, conditional de-globalization forces us to limit the manifestations of cultural pluralism, strengthen administrative and police tendencies in management. In both cases, the crisis of globalization forces us to reconsider approaches to urban development with a pause only for adapting the changes that have taken place.

On combining a comfortable living with business infrastructure and measures to ensure the safety

It is a difficult, but important issue. Any combination of functions leads to loss of the quality of their implementation. However, modern cities have to be surrounded with forests and have a

good transport system. The latter is extremely important, as it allows us to get to work and the center of the city very fast. The urban environment should be safe in order to parents could let their children walk and play in the street alone. In addition to the increase in the number of city functions, the style diversity of life is constantly growing, classes and professions, hobbies, means of conveyance, preferences are also extending. It is not interesting anymore to live like others today. Some people like to risk, the other give preference to safety. Roughly 1/3 of the city's population is pensioners. Youth and children are also about 1/3. Around 2/3 of city dwellers live in the outskirts. As a rule, they need to get from one part of the city to another by car, or public transport quickly. Another 1/3 of residents live in the center and near districts. All they want is to live in good environmental conditions. Who can become a paragon of functional priorities? It seems like the time has passed. We had to build a hierarchy of city priorities and focus on it earlier. Various social groups from different districts of the city have their own priorities. We should constantly monitor demands of the society and change priorities, trying to find a balance among them. At the same time, we should remember that regardless of priorities and preferences people will negatively perceive a decline in basic social standards that had been worked out by the society.

On the role of an individual in the urban economy and the role of the expert community in the dialogue between the government and society

Personality plays a significant role in the urban development. It is enough to recall that we are speaking about Haussmann's renovation of Paris, Moscow at times of Former Mayor Yuri Luzhkov, and current Mayor Sergey Sobyanin. Above all, new mayors set their strategic priorities of urban development, which meet his vision of problems and solution methods. Not a single mayor can implement project without reliance on public opinion, which confirms that his actions are an important public affair. If there is no consensus in the society, then there should be a majority at least. The expert community performs several important functions when the population interacts with the government. Firstly, it is necessary to analyze people's requests. Although it is believed that every city dweller is an expert in his own life. However, sometimes everyday tasks do not allow to express your opinion about the desired qualities of the urban environment. Secondly, the representation of own conclusions, the conviction of decision-makers in their social significance. The more authority an expert has, the sooner he will be supported by the city administration. Thirdly, a collective discussion of individual opinions and their improvement. Rejected alternatives happen sometimes during the process. On the one hand, there is a desire for stability and following the already paid way, and on the other, the necessity for changes. Moods of all participants play an important role, including the political intuition of the person who takes responsibility for a decision. This chain of actions can be explained the following way: "Identify – understand – explain – convince – defend – implement." It is impossible to do without a personality in this process, but sometimes this process lasts for years.

Konstantin Aksyonov, Doctor of Geographical Sciences, Professor of Department of Regional Policy & Political Geography at St. Petersburg State University

The impact of the crisis of globalization on urban development

No crisis of globalization. The pace of globalization is quickening as never before. Crisis is caused by unpreparedness of various public institutions and structures to adequately react to the globalization effects. The potential conflict lies in the fact that traditionally the main types of sovereignty are assigned to local and national institutions (states, nations, local self-government), and the interests of the new economy and the world community are global. Nature, goals, and way of functioning of existing institutions do not coincide, and sometimes they are opposite to the demands of globalization. And when the latter quickens, the conservative nature of local institutions comes into an open conflict with it. There are two ways out of this at least. Local institutions of global structures should be created and developed. The old fragmented system of public institutions should be also changed in favor of global processes. Both happen in reality: states waive their sovereignty to protect the global natural environment, global corporations are building networks of their regional and local offices that hold negotiations with local authorities. It is important what happens in the urban environment. The main differences between cities are their involvement in global processes and the

ability of their institutions to satisfy their needs as opposed to local and regional requests. These differences were systematically describe in the theory of a global city, the so-called wave theories. Unlike Western Europe, there is only one first-order global and mostly post-industrial city in Russia. It is Moscow. Saint Petersburg is a regional metropolis of international scale on the way to the postindustrial type of economy. It is not enough to form the basis of cities of cities that help Russia to receive benefits from globalization. These theories explain what should be done to overcome this imbalance. The main thing is to set this goal.

On combining a comfortable living with business infrastructure and measures to ensure safety

All cities are different. They are based on different economic systems, have different resources and development stages. There is no universal formula for all cities. Some cities should solve the problem of survival and deep restructuring of their economy. It is the main priority for them. Other problems, including environmental comfort and even security, are not among their top priorities. For others, an economic breakthrough may become a priority. In this case, interests of comfort remain secondary in comparison with business interests. However, it is also objectively. When the middle class is the majority in the city, it demands a comfortable environment and conditions for the development. Then this force starts subordinating even its business priorities to its interests. These three different types of city management described in the theory. Therefore, we should choose the necessary type depending on the circumstances. All three types have been replaced in Saint Petersburg over the past 20 years. I know the cities that failed to pass through the first phase.

On the role of an individual in the urban economy and the role of the expert community in the dialogue between the government and society

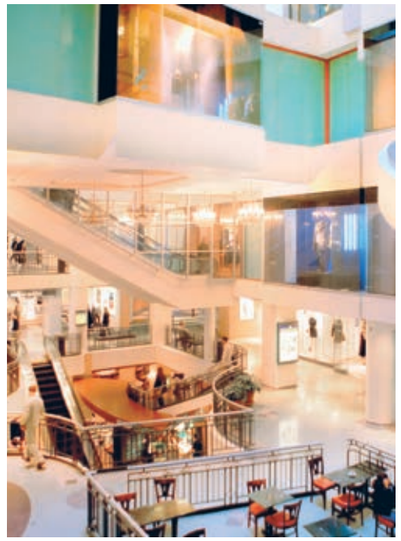
The matter is that Saint Petersburg is an idea of one person. The city became one of the world leaders 300 years later. As for the management strategy, each of the above mentioned ones needs its own management strategy. The main customers of urban development — authorities, business, and society — are being replaced. According to the the fact that we have started discussing more often the participation of the expert community in the development of a strategy for the development of megalopolises, they are indeed on the way to the middle class.

Underground Cities

Factors such as an overload of the land transport network and urban density in megalopolises force to build underground infrastructure facilities on a regular basis. Offices, educational institutions, shopping malls and even cities are built underground in addition to utility systems and transport hubs. We have selected the most interesting and peculiar ways of using underground areas.

I would like to share my impressions of my trip to Canada. I traveled to Toronto and Monreal, the two largest cities in Canada, that are famous for their development of underground areas. Almost all skyscrapers in Toronto have several underground floors where shops, restaurants and offices are located. There are metro stations, many large underground parking lots. All these facilities are connected by underground crossings with a total length of about 30 kilometers. People come to have lunch there. There are a lot of places for entertainment: theaters, parks, and various institutions of the service sector. Therefore, there are always a lot of people, not only employees, but also students, tourists in the underground city. Many clerks do not need to use cars. They live in flats above subway stations. They don't need to buy winter clothes despite cold winter in Toronto and Monreal. Strong winds are a common thing near Montreal. That is why the underground infrastructure creates a comfortable conditions for residents, allowing them to avoid traffic jams and bad weather. Metro, busses and trains are a part of the underground transport network in Montreal. According to statistics, about 500,000 journeys are made daily in the Monreal Metro. Moreover, the city management always strives to extend this underground infrastructure.

Damir Safin,
Chief Architect at Uralzheldorproject, Yekaterinburg



RÉSO — The Underground City — Montreal, Canada

RÉSO, commonly referred to as The Underground City, is a great example of how underground areas should be used. Its area is over 3.5 million square meters.

All the necessary facilities and infrastructure have already created — shopping centers, hotels, restaurants, offices, cinemas, railway interchange hubs, parking lots, metro stations and others.

It is warm and comfortable in winter there. Residents can stay indoors and go shopping. It is especially relevant in winter. Another important advantage is that the underground city allows to avoid traffic jams. All the infrastructure is available inside. It is easy for visitors to move among multi-storey malls and shops.

California Academy of Sciences — San Francisco, United States

California Academy of Sciences is not only one of the largest underground projects, but a wonderful combination of new technologies and wild nature.

There are a planetarium, arboretum and a museum and research institution for the natural sciences all under one living roof. You can walk on the roof and evaluate the most sophisticated engineering structure of the entire construction. It is possible to do without air conditioning, as the drainage system allows to cool the building and soil with rainwater. There are a lot of windows and transparent walls that allow to save electricity. Premises of the research institute are perfectly illuminated. A lack of energy is compensated for by solar batteries.

Temppeliaukion kirkko — Helsinki, Finland

Temppeliaukion kirkko is located in the heart of Helsinki. The interior was excavated and built directly out of solid rock and is bathed in natural light, which enters through the skylight surrounding the center copper dome. The church is often used as a concert venue due to its excellent acoustics.

There are no bells at the church. A recording of bells is played via loudspeakers on the exterior wall. From time to time, modern music is also played at the church. Temppeliaukion kirkko hosted the event where traditional religious masses were sung to the accompaniment of heavy rock music in Finland for the first time. The church is used to call Piruntorjuntabunkkeri that basically means a devil repelling bunker.

State Public Scientific & Technological Library — Novosibirsk, Russia

State Public Scientific & Technological Library, the largest library in Russia, is located beyond the Urals. The library has 10 floors — five below ground and five above ground. Reading rooms are on the above ground floors, books are kept in the below ground. The Library servers maintain 110 different databases, more than 47 millions records on all themes of scientific and technical tasks being solved in Siberia. The fifth underground is an utility area. The library is 13 meters under the ground. The ceiling heights are about 3 meters. There are 18 reading rooms in the library where 600 readers can work simultaneously. The library is visited by over 1,000 readers daily. The main building contains over 10 million books; a third of them are literature in foreign languages. Despite the fact that the number of lower floors are not enough, it is impossible to build extra ones. Lots of legends and rumors have been spread about the library's underground. This place has become very popular among tourists.

The Bolshoi Theatre — Moscow, Russia

The main theatre of Russia has changed its internal and internal appearance many times. The most recent reconstruction ended in 2011. As a result, the auditorium and foyer were reconstructed, and the underground space was significantly expended. The area of the theatre has doubled — from 40,000 to 80,000 square meters — after the construction of six underground floors. The theater is 27 meters under the ground. A glass elevator takes you to a hall-transformer that is located on the -1 floor. It is an interesting fact that geographically it is located not in the theater itself, but under the Teatralnaya Square. Additional underground areas allowed to create a completely new hall for rehearsals and performances, as well as significantly extend the orchestra pit. Now it is considered to be one of the largest in the world with 130 seats for musicians. In addition, there are a lot of new premises in the theatre, including a modern music recording studio.

Our country has huge potential for exploring underground areas. Domestic experts use the most modern technologies and have experience of construction in the most complicated hydrological conditions — from unstable ground in Saint Petersburg to the permafrost in the subarctic. Setting goals is the most important issue for activating underground construction. It is necessary to use international experience in the construction and design of underground cities. It became obvious half a century ago that the construction of underground cities is a necessary condition for the sustainable development of megalopolises and creation of comfortable living conditions in modern cities. Our goal is to convince decision-makers that there is no alternatives in formation of the underground infrastructure of large cities.

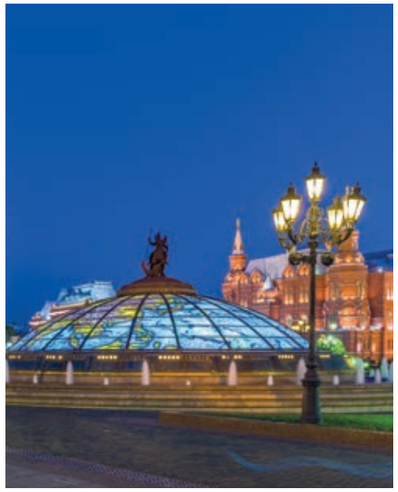
Sergey Alpatov,
General Director at Russian Society for Trenchless Technology

The Narvinsky Tunnel — an ecological tunnel for leopards, Primorye Territory

Eco-tunnels (wildlife crossings) allow animals to cross human-made barriers safely and assist in avoiding collisions between vehicles and animals.

There are an eco-tunnel for penguins in New Zealand, for bears in Banff National Park (Canada), and for elephants in Kenya. This tunnel was built in 2016. The first ecological tunnel was built near the Narvinsky pass in order to wild animals could cross on the territory of the Ussuri taiga safely. It is a unique project that was implemented more for drivers, rather than animals.

It is much better to drive through a 565-meter tunnel in the rock, than along a dangerous serpentine road. Now leopards can cross human-made barriers safely.



Okhotny Ryad underground shopping centre — Moscow, Russia

Do you want to walk on the roof of the shopping mall? No problem! A lot of people go shopping every day.

Okhotny Ryad underground shopping mall is located under Mazhnaya Square. There are over a hundred different shops, cafes, restaurants and even a small car parking in the multi storey underground shopping mall with an area of about 70,000 square meters.

In fact, it is a small underground city. Initially, it was planned to build a seven-storey-underground shopping mall — 42 meters under the ground. Having conducted researches psychologists came to the conclusion that minus three levels would be enough in order to visitors could stay calm in the mall. By the way, Okhotny Ryad is the only shopping centre within the Boulevard ring.

Pocinho High-Performance Rowing Centre — Pocinho, Portugal

The unique sports complex is located in Douro, a beautiful valley in Portugal. The sporting centre for canoeing and rowing, designed by Portuguese architect Álvaro Fernandes Andrade, is inspired by the region's terraced vineyards and the haphazard white volumes of the estate buildings found there. Its area is 8,000 square meters. The sports facility consists of three parts: a training area with many sports halls, a recreation area with restaurants and a residential area with cozy apartments. Since the whole Upper Douro Valley is a UNESCO World Heritage site, the architect wanted to integrate the building into its surroundings as smoothly as possible. Solar gain is ensured in these rooms through their long south-facing skylights even at nighttime. In addition, well-insulated green roofs allows to reduce energy costs.

Orchard Road — Singapore

Orchard Road got its name from the nutmeg, pepper and fruit orchards or the plantations that the road once led to.

However, times change. Today tourists don't buy fruits there. Orchard Road, a 2.2 kilometre-long boulevard, is the retail and entertainment hub of Singapore. Numerous boutiques and brands that can satisfy demands of the most exacting shoppers. Huge shopping malls are all around here. You can cross Orchard Road under ground. Orchard Road has a well-developed underground infrastructure, consisting of numerous pedestrian tunnels that tie shopping centers with neighboring streets. Singapore is one of the most densely populated megalopolises of the planet, with a relatively small territory.

Due to absence of undeveloped areas on surface local authorities have the only way out of this — they promote building underground facilities.

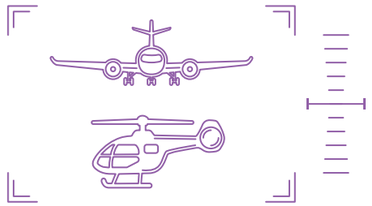
Text: Аналитическое управление АКИГ

Facts & Figures

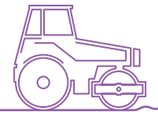
3.1 billion rubles
The federal budget has a subsidy reserve amounting to 3.1 billion rubles for implementing investment projects on import substitution in the field of industry in 2017. According to the Government of the Russian Federation, the budget for 2017–2019 has a reserve amounting to 12.8 billion rubles

138 billion rubles
According to the Government of the Russian Federation, oil companies invested 138 billion rubles in 2016 to modernize oil refineries

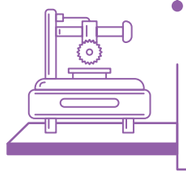
287,000 employees
According to the Government of the Russian Federation, the number of workers in the electronics industry was 287,000 at year-end 2016



142 planes and 188 helicopters
Russian aviation industry produced 142 planes and 188 helicopters in 2016. According to the Government of the Russian Federation, 136 planes and 190 helicopters were supplied to the domestic market



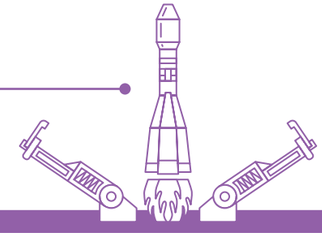
1.645 billion rubles
According to the Government of the Russian Federation, the total budget for supporting road construction and municipal machinery amounted to 1,645 billion rubles in 2016



24.6 percent increase
Export of machine-tool products increased by 24.6% in 2016 and amounted to 2.28 billion rubles, according to the Government of the Russian Federation

6 vessels
According to the Government of the Russian Federation, 6 general-purpose vessels were put into operation by shipbuilding companies in 2016

250 technologies
Over 250 industrial technologies for the production of competitive high-tech products were developed by defense industry organizations in 2016. According to the Government of the Russian Federation, the list of military-industrial complex consists of 1,366 organizations



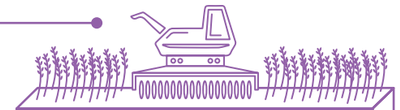
19 launches
In 2016, the space industry carried out 19 launches in the interests of state and commercial customers, the Government of the Russian Federation reports

88% of producers
According to the monitoring "Trends and Challenges of Social and Economic Development", 88% of producers assessed their financial and economic situation in early 2017 as good or satisfactory

62.3 billion rubles
According to the Ministry of Industry and Trade of Russia, the total amount of government support for the automotive industry in 2017 (at the expense of the reserve fund of the Government of the Russian Federation) is estimated at 62.3 billion rubles

107 techno parks
According to the Government of the Russian Federation, 107 techno parks, 95 industrial parks, and 39 industrial clusters appeared in Russia

108 billion rubles
According to the Ministry of Industry and Trade of Russia, the state allocated 108 billion rubles for the automotive industry, the consumer goods industry, agricultural machinery, and transport engineering in 2017



50 percent market share
For the first time in decades, the market share of Russian agricultural machinery in the domestic market is over 50% in 2016, as reported by the Government of the Russian Federation

Pitch In/Pitch Out

Who and why needs industry localization? How helpful and difficult is it? How to adequately use its mechanisms in practice? Vladimir Rudashevsky, the deputy head of the commission on industrial policy of the Russian Union of Industrialists and Entrepreneurs explains the key element of international industrial cooperation.

Who needs localization?

To understand the problems of industry localization (IL), one should distinguish the goals a partner company (extensiver) pursues, when moving production out, from the goals of a host party (recipient, most commonly, official authorities).

The extensiver is committed to establish stronger market positions through guaranteed sales of products, where geographic proximity to the consumer and sources of raw materials play an important role, which reduces transportation costs to 25% on certain types of products. The recipient expects the increase in investment and employment, additional tax revenues, direct access to cutting edge technologies, expertise, corporate governance best practices and establishment of goodwill.

Often, cheapness of the recipient's workforce has a fleeting positive effect and cannot stand for a decisive factor in selecting a production site. Cooperation with national or regional economic operators deserves more attention. For example, the production of automobile light alloy wheels near RUSAL foundries would bring a tangible benefit: Volkswagen alone requires at least 10 million such wheels. Meanwhile, up to 90% of the wheels are presently imported from China.

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Companies seeking to expand the market for their products and involving assessment of further promoting more often localize their production. As a rule, they take into account the principles of industrial policy of the country of localization, which promotes obtaining state support or imposes import restrictions or prohibitions on specific goods. An outstanding example of such approach is Russia's automotive industry that has received significant state support for years.

The Federal Law on Industrial Policy in the Russian Federation grants special investment contracts (SPIC) as a tool to support the industrial development. Supposedly, by concluding a special investment contract after the termination of industrial assembly agreements granting temporary benefits to foreign automakers, they can count on permanent preferences.

For example, Mercedes-Benz has already announced that such SPIC will be signed before the year's over. The company assumes obligations to localize and develop technology, as well as to establish new production. In return, it receives tax credits, simplified administrative procedures and, most importantly, the status of a Russian producer, hence, access to state contracts.

Another example is a 10-year SPIC concluded with the German-Japanese concern DMG Mori, which stipulates the production of the newest turning and milling machines to be based in Ulyanovsk, and the production facility to be upgraded there. The Swiss-based Sika Group will open two enterprises in Moscow Oblast, in addition to the plants in Volgograd and Lobnya involved in the construction of the Zenit Arena stadium and the Kerch Strait Bridge.

The Russian pharmaceutical sector takes about the same way. The direct ban on foreign drugs import,

introduced by the Ministry of Health of the Russian Federation in the end of 2015, prompted all major pharmaceutical companies to redouble their efforts on IL. The government put in place measures to support the localization in pharmaceutics, including through the introduction of restrictions on public procurement of foreign medicines. In just the past four years, the European business has created more than 200 new ventures in Russia.

Another subtle aspect is the distinction between localization and expansion. The expansion of economic activity beyond its own territory is perhaps the most common method of securing national competitiveness. Industry localization contributes to preserving of Russia's economic sovereignty, as it develops its productive power: technological practice, human potential, environmental, resource and energy factors.

Who goes for localization?

Sometimes, IL is viewed only as a tool to bypass export-import restrictions. This is not entirely true, though possible: for instance, on account of the introduction of food counter-sanctions by Russia, a store selling well-known food brands has opened in Moscow, thus combining domestic production and sale of deli products.

Moreover, numerous intergovernmental commissions bring forward proposals and projects for the development of economic cooperation, including industry localization. The European countries participating in the Partnership for Modernization initiative are of particular interest. For instance, the Russian-French Council on Economic, Financial, Industrial and Trade Issues has unfolded a program that includes 14 projects in five industries. It is noteworthy that, perhaps for the first time the direct use of an IL mechanism is envisaged in such document, so that well-known Russian and French companies can expand the range of automotive components already produced in Russia.

Do sanctions thwart industry localization? Yes, and most directly, because they include explicit bans on the development of financial and trade ties. The economic losses from such political decisions are billions of euros worth. Such artificial expense is hard to excuse amid the total economic crisis. Could have anyone imagined recently that Russia, which inherited the ideologically narrow-minded economic policy of the USSR and faced merciless criticism from European countries, would bring forward the same accusations against them? To make things worse, besides the pressure already applied on Russia by sanctions there is no other thing left to do but to introduce a ban on industry localization.

Vladimir Rudashevsky,
deputy head of the commission on industrial policy of the Russian Union of Industrialists and Entrepreneurs, doctor of economy, professor

To find ways for cooperation in industry localization, one can compare Russia's EU import structure with the Priority Areas for the Development of the Russian Federation until 2030. Preference will be given to companies that shoot for localizing products not manufactured by domestic producers in the first place, and those who intend to engage Russian companies.

Industry localization in another country is not a reproduction of all its components, but rather a watchful adjustment of this system to regional requirements: market demand, competition, cooperative correlation, readiness of the whole territorial environment for innovative changes.

The WTO agreement on public procurement, which the RF Ministry of Economic Development appeals to join, stipulates that government authorities cannot demand the country of origin to be specified in the requirements for goods. This secures unrestricted access for foreign suppliers to tenders.

During the Hanover exhibition, Minister of Industry and Trade Denis Manturov said that Russia had already proposed to standardize Russian requirements and approaches for localization to introduce new support measures.

“For us, the degree of localization and import substitution is the foremost criterion,” said Manturov. The minister stressed that it was not a question of complete localization in Russia, “It all relies upon how profitable and important it is in terms of the national security strategy.”

Import substitution, as a response to the sanctions policy, also triggers the IL mechanism encouraging Russian companies to assume the role of extensivers. For example, TechnoNICOL locates its production in European nations, acquiring local companies. That implies that the company replaces imports with exports, and the importation of localized products is not exposed to sanctions. Thus, artificial market distortions that are currently in place are fixed economically rather than politically, therefore, preventing political ideology from intervening business.

How to localize production?

Formal requirements are set out in regulatory documents, but the list is of sectoral nature. Since production sites are located in municipal or regional territories, local authorities also have the opportunity to supplement the sectoral list of requirements. At the same time, a foreign extensiver partner can expect substantial benefits and preferences. Analysis of unsuccessful IL attempts shows that the process is not always done correctly. Discrepancies and blind spots in the Russian lawmaking cause this. For example, in many constituent entities, regional and municipal borders are not defined.

To acknowledge that the localization has taken place, the level of output, as a rule, should correlate with the particularity of production and the complexity of its flow charts. At the same time, depending on whether an economy needs specific products of a localized industry, the output limit for produce or components can fluctuate over a large range.

Cooperation with domestic manufacturers and the state of market competition play a big part. This is especially true for the food industry market, as almost all major foreign food companies are localized — Danone, Valio, Hochland, PepsiCo.

The degree of localization is an essential point in the agreements claiming that foreign producers should undertake to establish production in Russia. Most of them condition its gradual leveling at 60%.

How valuable and difficult is localization?

In Russia, IL is still an exception from the rule for building strategies for the development of industries and territories, just like it has been typical, say, for China for many years.

On the one hand, Russia drops behind in IL due to wariness that stems from the job that extensivers do and serious adversities in Russia’s business climate.

Public organizations such as the Russian Union of Industrialists and Entrepreneurs, Delovaya Rossiya ("Business Russia"), Opora Rossii ("the backbone of Russia"), the Chamber of Commerce and Industry persistently work out and submit proposals to supreme state authorities to improve this climate and reduce administrative pressure on business.

On the other hand, the inhibition of IL is associated with the autarkic (closed) economic system adopted by federal and territorial governments. The historical burden of building a closed society and economy in the USSR continues to haunt the minds of people. Eminent Japanese economist Seiji Tsutsumi noted that archaic policies constrain successful modernization greatly. Moreover, the Japanese society, as we recall, used to be extremely closed.

Conservative development of the Russian economy is particularly typical for federal subjects. The federal government was even forced to include such an indicator in KPI for governors as the amount of attracted foreign investment to a region. Industry localization, in essence, is also an investment process. The Kaluga, Ulyanovsk and Leningrad oblasts are cases of the most invested regions. The solid renewal of the government corps with young professionals manifests that the gradual shift of paradigm will be promoted to stimulate the economic development of the regions.

Automakers have gained the most successful IL experience. Without a doubt, the program of state support for the industry, including discounted vehicle loans and the fleet renewal program played a stimulating role. Italian home appliance manufacturers have gained little yet positive IL experience: they built a territorial cluster in Lipetsk that consolidated not only Italian but also Russian manufacturers. The Dutch giant automaker DAF placed its production in Russia more than five years ago. The Chinese corporation Dalian Machine Tool Group localizes the lathe production at the Moscow gas meter plant Gazdevice. Pharmacists followed the same path and built a similar cluster in Kaluga. Rusnano is negotiating to localize the world's largest pharmaceutical company in the Technopolis Moscow.

We must perceive the successful localization of food production and chain retailers, as well as banking systems that have occupied a prominent place in the Russian market by making accessible nearly the worldwide range of financial services. Industry localization can be used in high-tech medicine and medical equipment, appliance manufacturing, shipbuilding and timber processing. There is even a bizarre example: plans for the development of Disney in Russia.

In general, the authorities intend to improve the situation: 12 target business models developed for the regions have been endorsed, which will push up Russia's world rating in Ease of Doing Business. New forms of business organization such as industrial clusters are introduced. The government also accords the status of advanced development territory. There is discussion of re-export VAT reimbursement to businesses that localize production in Russia. The agendas of all significant economic forums are in one way or another centered around developing the investment potential of the Russian Federation.

The challenges that a foreign company may face in industry localization fall into three groups. First, these are errors in drawing business plans of IL projects. Second, poorly predicted changes in the external environment, at global and local level. According to the WTO, the G-20 countries introduced 145 new trade restrictions in 2016 and 1,583 restrictions in the last seven years. This also should include the innovation paradox: industry localization increases the demand for products, including due to constant updating of the model range, design and diversity of produced goods.

And this yields losses in exclusive profit from standard products, the release of which is fine-tuned technologically, financially, organizationally and personnel-wise. Products by the Spanish company Zara first did not comply with Russian technical regulations. The Ministry of Industry and Trade proposed them to use the IL mechanism to include high technologies for manufacturing competitive apparel. This strategy aims to transfer innovative projects to Russia in order to root an extensiver to gain a foothold as a market leader, in Russia and globally. This is the technique used by German companies, such as the Siemens corporation, known for long-standing experience in the Russian market. Third, mistakes in the general goal setting in industry localization.

Despite the enormous unmet demand for technology in Russia, the mission of IL is to produce up-to-date products, as well as to export them to locally associated markets (EAEU, EU, BRICS, and SCO) for global expansion. Given the fact that the introduction of the tax maneuver "22/22" to stimulate exports is on the agenda in Russia. Such expansion will bring tangible economic effect.

This perspective makes it possible to rationalize the promotion of domestic producers across foreign markets with certain losses of jobs, tax revenue and human capital. Localization applies to production, as well as includes research and development.

For example, the French company Schneider Electric launched in Skolkovo a center for life-cycle development of software, dispatching, control and monitoring systems for the energy, oil & gas industries.

Nevertheless, the conditions that have been put in place in Russia for the industry localization of foreign companies are not favorable enough to apply this form of investment strategy broadly. Crisis factors could play a catalytic role for the actuation of industry localization in stakeholder programs and territorial systems. Unfortunately, for the time being, we do not observe this because of political interference in the functioning of markets, in particular, due to the sanctions policies of the countries occupying leading positions in the global economy.

interference in the functioning of markets, in particular, due to the sanctions policies of the countries occupying leading positions in the global economy.

How to Enter Foreign Markets?

Almost all businesses have plans to become more competitive and enter foreign markets. However, entrepreneurs often refuse from this perspective due to some problems on the way to this goal. Editorial Board of the Strategy Journal together with the Russian Export Center has launched a new series of publications where entrepreneurs will share their experience, tell us what you need to pay attention to and how to become a participant in the international market.

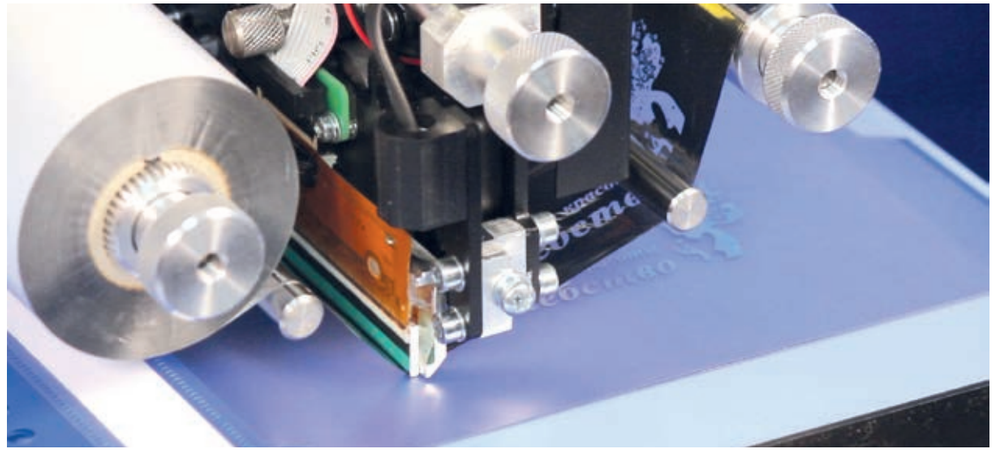
Digital Hot Foil Stamping Machine

В 2003 году Александр Виршке впервые задумался о собственном бизIn 2013, Alexander Virshke decided to register as an individual entrepreneur. He was a successful designer who dreamed about his own studio. Having estimated the demand for such services in Russia, he decided to change his activity and devoted himself to printing. His company specialized in the so-called 'holiday printing' where digital stamping foil is often used in the production as decorative elements. Thus, it was necessary to purchase modern equipment. When searching for equipment it was found out that the only available equipment for purchasing in the Russian Federation was made in the United States and its price was too high. However, Alexander Virshke saw the problem as an opportunity.

"I realized that not only my print studio but also other companies needed such a device." I analyzed the potential volume of the market and I decided that it would be profitable to invest in developing your own device, a domestically made analogue," Alexander Vershke pointed out.

Foil Print, the first domestically made digital hot foil stamping machine, was unveiled after a bit more than a year. After a while, he managed to find a supplier of components from Japan and develop a new, more advanced printer model.

We finally found out what the market had really needed. That is why our invention was a bestseller. In 2016, the share of sales of our equipment increased from 40% to 76% in the Russian market. It was exported 14%, he added.



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Success was significantly accompanied by the fact that initially the entrepreneur focused on exports and set a goal to enter not only Russian, but also international markets.

Strategy

According to Alexander Virshke, the following 6 steps will help a company enter a foreign market.

Step 1. Product development, production, solving the problems that may arise when testing.

Step 2. Translation of software, instructions and other documents into English. Creating a website.

Step 3. Uploading videos on YouTube that show how our equipment works with names and subtitles in English.

Step 4. Understanding the interaction scheme with customs: cooperation with international transport companies to deliver goods to a foreign buyer.

Step 5. Calculating and inclusion the cost of delivery of goods in the final price. This system allows clients to make a purchase decision easier, as all delivery issues are solved by the supplier. Clients have to pay only import customs duty when receiving goods.

Step 6. Creating an additional account in the PayPal system (for convenience of payment by our foreign clients). However, not a single client paid this way.

Inventors of the Foil Print device have developed a set of rules and recommendations based on their many years of experience. Above all, we should understand that the international market is oversaturated with goods and services. Alexander Virshke is sure that it will be difficult for Russian exporters to succeed in the foreign market. When taking the decision to enter foreign market, you have to be confident that the product meets the necessary quality, reliability and price. For this, you should ask yourself a few questions.

To assess the quality, imagine that your product is next to a similar product by one of foreign competitors. Will your product win or lose competition against the same foreign product, regarding appearance, functionality, usability?

To realize that, think about whether it is possible to deliver your goods abroad from Russia safely. Is it possible to preserve the appearance and functionality of these products during the entire warranty period?

How to repair, or return this device if something goes wrong? How will it be arranged? Who will pay for providing these services?

To analyze that your price is justified and competitive, you should find a balance between the product price and reality, considering the above mentioned characteristics. When pricing it is necessary to take into account additional costs for customs clearance, transportation, foreign intermediary margin (in case of participating in the transaction), import customs duty of the importer's country. If all these things confirm that your product is better than others. Then you should improve you English skills and get down to work.

Barriers

Project developers faced some difficulties when entering foreign markets. Thus, they spent a lot of money to receive a conformity certificate, allowing to enter the European market. When testing in a laboratory, it was found out that Foil Print does not meet some certain requirements of noise immunity. This led to changes in the electronics of the device. Fortunately, at that time developers were engaged in modernizing main electronics, and they simply took it into account and fulfilled these new requirements.

The most difficult thing for project developers was cooperation with customs service. Alexander Virshke noted that after receiving the first order from Europe they solved the issue of cargo delivery. It was sent via Russian Post. However, the organization requested documents from the customs, including a product notification document. The document would confirm that Foil Print had no cryptography and encryption components that were banned from exporting from Russia. This certificate is issued by Federal Security Service of the Russian Federation. A local branch of Federal Security Service failed to help Alexander Virshke, re-sending him to a Moscow office. The central office noted that a product notification document is necessary for devices, which have encryption functions.

Unfortunately, it is more difficult to compete in a foreign market, rather than domestic one. Mainly, due to new rules, new difficulties, different mentality of partners, high level of competition, exchange control, and different exchange rates. However, there are some benefits: a more even loading of the enterprise's capacities, diversification of risks, reduction of production costs due to increased production volumes. In future, we are going to make business abroad in a more active way. In addition, we have plans to launch new projects that are not related to current activities, but have a prospect of entering the global market.

Alexander Virshke,
CEO at Virshke LLC

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This document is not necessary, as Foil Print has no such characteristics. It was a vicious circle: one controlling organization requires a certificate from another, which sends it back instead of issuing a certificate. According to Alexander Virshke, another difficulty was filling out a customs declaration, which is required for exporting products. Mistakes in the document may lead to significant fines. To avoid this, it is necessary to ask for customs brokers' help, but average price of their services is around 16,000 rubles.

"It means that exporters spend 16,000 rubles on filling out paperwork with each delivery. Certainly, if you consign large lots of goods, then these costs will be unnoticeable in the total cost. However, when the price of the goods is small, these expenses will be much larger," he complained. "I do hope that the customs procedures for exporters will be simplified soon."

Export Support Center

Having achieved success in Russia in 2016, the company started cooperating with the Fund 'Support Centre for Ugra Export', a regional operator of the Educational Program of the Russian Export Center (REC). The REC courses — 'Introduction to export', 'Customs registration of export operations' and 'Documentation support of export activities' — were a strong motivation for Alexander Virshke. This helped him secure government support and feel more confident when entering foreign markets.

In addition, the center helped solve some specific problems. The experts organized a meeting with representatives of the company with the head of the customs service, where he successfully resolved the issue of providing a certificate of notification.

"I am so thankful to Support Centre for Ugra Export for help. Frankly speaking, initially I was skeptical at first that the state would help us develop our company. But my fears were in vain. Our company was audited and given recommendations. Then we participated in a business mission. All doubts disappeared soon. At present, we cooperate on a regular basis. Support

Centre for Ugra Export has a keen interest in our products and helps us," Alexander Virshke pointed out.

For now, the company has already managed to sign first contracts to export Foil Prints, as well as start selling and supplying products to the countries of the customs union. In addition, we sold our devices to Kyrgyzstan, Estonia and Norway.

Last year we replaced almost all foreign producers in the Russian market. This year we will start entering foreign markets. In April, our Indian partners presented our device at an exhibition in India. In May, we personally presented it in Germany, in July we are going to do the same in Bulgaria, and then in India in December. We are currently cooperating with our two partners from India on entering the Indian market in order to have an opportunity to compete with local producers there.

I managed to get acquainted with many partners personally at the exhibition in Germany, where we agreed to start developing a new printing device that satisfied demands of their clients. "Now we are actively negotiating with an Italian company," Alexander Virshke concluded.

Miracle Technology in Asia

On June 1, Huawei and Megafon set a new digital record in Russia. Fifth generation mobile network helped achieve the mobile Internet connection at speeds of 35 GB/s. According to GSMA, Asian countries are assigned a special role in improving innovative developments in the field of information and communication technology (ICT). These countries will set trends in the market.

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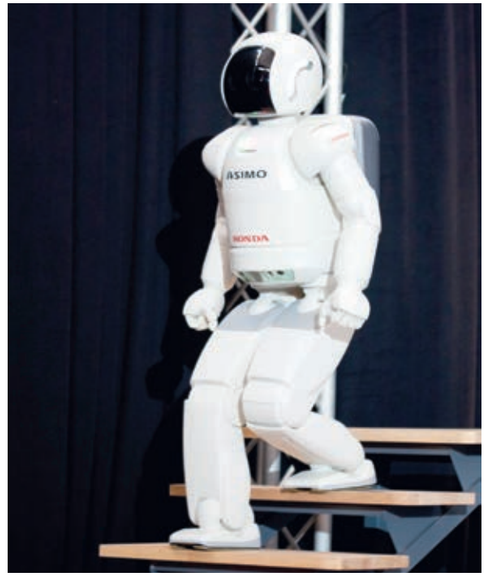
Leading Positions

Information and communication strategy is mainly focused on clients' changing needs. Some South-East Asian countries have overtaken the so-called 'digital powers' in the development of electronic technologies for several years. The main key to success is that they identify changing needs at the stage of their clients' desire. South Korea topped the Infocommunication Development Index. Another two Eastern countries are among the Top 10 counties.

According to experts' forecasts, Asia countries may become the flagship soon not only in the ICT market, but also in the digital economy sector, which includes ICT. According to Boston Consulting Group, South Korea in the second, regarding the growth dynamics of the share of the digital economy in GDP among the G20 countries. China is the third.

By 2018, expenditures of enterprises on information technology in Southeast Asia are estimated at $62 billion, Garnet reports. Eleven countries in the region, including Singapore, Malaysia, Indonesia and Thailand, spend more than 80% of the total cost on information technology. Around $52 billion in 2015. Technological projects of South-East Asian countries are becoming more attractive for investors for many reasons.



Strong Support

Significant support by the Governments of Asian countries plays an important role. The IMDA department (InFocomm Media Development Authority) adapts the state policy in terms of modern technology development. IMDA also actively develops the urban environment, forms an 'ecosystem' of many innovative start-up companies that help the city, business and residents to develop. Training of students with virtual reality technology, IoT development, digitalization of small and medium businesses are implemented by the government entities. Government support and almost ideal conditions for business development (for example, the company's online registration takes only 15 minutes) led to the growth of commercialized start-ups in the country. From 2005 to 2014, the number of startups significantly increased from 24,000 to 55,000. In 2016, the IMDA department launched the Smart Nation Fellowship program. Its goal is to find and attract academics, developers, and engineers from all around the world who can create applications and develop technologies that improve people's lives and infrastructure of the city. Singapore has the highest performance in providing high-speed Internet connection. According to Tufts University, Singapore is the country with the fastest-changing digital economy in the world.

Fifth Generation Technology

"We have entered an era where all areas of life are going digital. As the future network technology, 5G will ensure connectivity anywhere, anytime, when in motion and with virtually no latency and unlimited possibilities for application. This will require the efforts of the entire ecosystem — operators, equipment manufacturers and industrial partners," Aiden Wu, Huawei Russia CEO, announced the launch of pre-commercial versions of 5G networks at 2018 FIFA World Cup that is to take place next year in Russia.

A 5G network will provide up to a million connections per square kilometer. In addition, 5G will be significantly faster. Energy consumption can be reduced tenfold.

China, Japan and South Korea hold leading positions in testing and developing mobile technologies, leaving North American and European countries behind. The largest operator of communication, China Mobile, the world's largest mobile phone operator, has increased investments in the field of research and development by 30%. The China Mobile 5G Innovation Centre (5GIC) was formed by the operator together with Huawei, Ericsson, Nokia, Qualcomm in order to to test out their new equipment, before it is brought to market. The world's

largest carmakers — BMW and Audi — have already shown keen interest in the new standard and joined the Automobile Association 5G together with developers and operators.

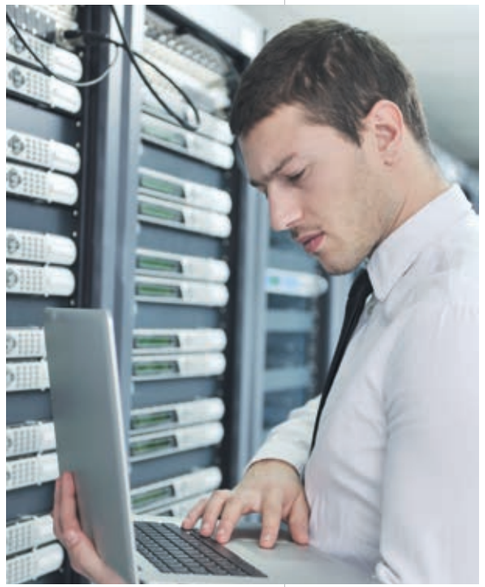
Contactless Payment

The authorities of India withdrew from circulation around 86% of banknotes last year. South Korea reduces the issue of coins and by 2020 plans to abandon the coinage, according IMF experts' report "Finance and Development" in 2016. The replacement of paper currency in circulation by digital payment systems in Southeast Asia is much more smoothly than in many countries around the world. Specialists consider that such success can be explained by the high speed of transactions and confidence in online payment security. It was made 32 billion mobile transactions during a week via WeChat, a Chinese competitor of Facebook, with 600 million users. More than via PayPal during a year. The Indian mobile payment market is increasing rapidly. The volume of transactions has increased by 29.3% for the last two years. This indicator is 17% in Vietnam and Singapore.

According to market experts, contactless payment vie a smartphone is becoming more and more popular. It is expected that transactions amounted to 32 billion dollars will be made in the region by 2021.

Taking Care of Business

Digital platforms are a significant advantage for business in terms of development of modern technologies. Gartner expects that 75% of large organizations will invest in the development of technological solutions for digital transformation of business by 2020. Alibaba is a global player and absolute leader in global e-commerce. In 2016, Jack Ma, the founder and executive chairman of Alibaba Group, proposed to create the Electronic World Trade Platform (eWTP), thus establishing digital free trade zones for small and medium businesses.



From 2003 to 2009, ICT created
about 5% of global GDP.
In 2008, 5.4% of GDP.
It is expected that the sector will reach
8.7% growth by 2020

Alibaba will continue to take advantages of the Internet infrastructure and large data," says eWTP Project Leader at Alibaba, Song Juntao. The company's revenue is $289 million that were received from the sale of cloud systems and infrastructure network solutions. Alibaba collects user profile information about 630 of 645 million Chinese registered users and plans to provide data as analytical products to third-party advertisers.

A subsidiary of Alipay plans to launch a cloud service based on the bitcoin blockchain technology. Today Alipay provides services for more than 350 million registered users and processes over 80 million transactions a day. The payment service controls almost 80% of the mobile payment market in China. Alipay Wallet is actively used by 109 million clients.

Huawei is also actively involved in developing cloud services. "Enabler and Driver of the Intelligent World," says Ken Hu, Deputy Chairman & Rotating CEO at Huawei Technologies. In his opinion, the improvement of storage systems will help reach the goal. According to CEO, all corporate information technologies will be cloudified by 2025, and 85% of all applications have already been transferred to the cloud storage. Huawei has been investing in cloud services and related products for more than 10 years. The company offers an open platform in the market and service-oriented multi-profile systems (storage systems).

Smart Nation

Smart cities appear and develop in the countries with a large a large share of investments in the sector of information and communication technology. IoT, large data, 5G, modern security and energy efficiency systems are necessary for the development of smart cities. According to the 'The Evolution of Smart Cities' research by Government Technology, Asia is a global leader in the number of cities on their way to smart cities. Songdo, Fujisawa, Singapore, Hong Kong, Nansha and many other cities from Southeast Asia. In 2016, Juniper Research showed preference to Singapore among other best world smart city nominees.

"Singapore is deploying an undetermined number of sensors and cameras across the island city-state that will allow the government to monitor everything from the cleanliness of public spaces to the density of crowds and the precise movement of every locally registered vehicle," says Victor Wong, Project Director Communications Events at UBM SES.

According to Barbara Chiu, Vice President & Managing Director of Cisco Taiwan, Hong Kong and Macau, Singapore "aims to become the first Smart Nation in the world." For this purpose, a personnel development program is being implemented in the fields of data analytics, smart robotics, large data and cloud computing.

"Singapore is constantly seeks to develop a technology-savvy population through technological education, and to support industrial development and entrepreneurial interests," Barbara Chiu says.

The annual
amount of investments in ICT
is about $500 billion

ABBsolute Integrity

Transport engineering is one of the oldest industries driving Russian economy. During crisis years, it is most exposed to economic volatilities and external constraints. How to maintain production amid recession, and secure economical practicability of localization and import substitution? Should we expect a technological breakthrough in transport engineering? Vice-president of ABB Russia, Kazakhstan and Belarus, chairman of the Modernization and Innovation Group of the European Business Association Mikhail Akim gives answers to the questions.

At INNOPROM-2014, you said that Russia profoundly lacks industrial robotics. Has anything changed in three years? How would you rate the prospects of Russian robotics?

Woefully, nothing has changed during this time. The robotization level in the Russian transport industry is extremely low. Its development depends highly on mental shift, while in Russia there is still little understanding of the robotics value.

Robots are now used in the automobile industry; the Ministry of Emergency Situations of the Russian Federation employs special purpose service robots. The transport and other industries, however, are still slack to utilize robots.

Statistics by the International Federation of Robotics suggest that in this respect Russia is ten times behind the developed countries, such as South Korea with the largest ratio of industrial robots to total employees. In the meantime, South Korea is one of the most export-oriented economies, and the leap it made over the recent years was largely due to robotics.

The Russian robotics market measured in monetary terms would approximately make 1% of the world's market. It makes no sense to produce robots having such size, as it is not economically feasible.

First of all, it is important to maintain integration as it creates the biggest additional costs; it is pointless to build a manipulator alone. Robots are a manipulator and software wrapped up on a production line, so partners and system integrators, who are widely represented in Russia, usually carry out this integration..

How high is the degree of import substitution in transport engineering? Does the industry need total import substitution?

As I see it, overall import substitution is unsafe, you must not attempt to do everything yourself. Unfortunately, the concept of import substitution becomes a dogma coming down to a belief that everything needs to be produced locally. Moreover, this is inefficient from the economic point of view, since the cost of production increases.

Soviet-type vertically integrated enterprises are obsolete. Today, any company has assembly operations, suppliers, a market and a streamlined supply chain. Having a huge product portfolio, as a rule, the company manufactures every product in one or two places on the planet, afterwards this product is shipped globally. For example, there are two/three major transmission manufacturers, two/three fuel equipment manufacturers, a dozen engine building world leaders and three/four electrical engineering manufacturers. It is critical to include their capacities, communicate directly with suppliers and have duty-free access to the best components.

It is impossible to forcibly create conditions for economically feasible import substitution without developing ways to obtain components at the most affordable prices.

The economy must be diversified. In the sectors where requirements for import substitution are artificially high, particularly requirements for a mandatory portion of locally produced components, the cost of these components is much higher. More expensive logistics and larger geographical size of Russia make domestic production noncompetitive.

Assembly operations, moved to other parts of the world where there are no such market restrictions, will cheapen the procurement accordingly, and make the cost of production more competitive.

Look, for example, at what is happening to the automotive industry: there is a huge overcapacity, which burdens the cost of the products, in other words, overwhelms the end user. This causes more fluctuations and a drop in the market, as the cost is way too high. All processes should run on the backdrop of global integration. To reduce costs consolidation is needed.

The paradigm must be changed, there should not be a discriminatory practice towards the manufacturer. Marcus Osegowitsch, general director of Volkswagen Group Rus, in my opinion, proposed the smartest solution. He said, "We are ready to export, but empower us to import duty-free components for the equal amount of exported goods."

Of course, I understand that the idea of import substitution have not arisen out of thin air. There are good reasons for this: first, the need to secure access to the acquisition of equipment and technologies produced by global leaders, regardless of a geopolitical situation, and furthermore, awareness that the economy requires diversification, that the mere "oil needle" is definitely a blind alley.

"It is impossible to forcibly create conditions for economically feasible import substitution without developing ways to obtain components at the most affordable prices"

How do you rate the dialogue between business and government? What has been done lately, what new formats of interaction do you see?

The proper dialogue should be built primarily on economic grounds; the economic ideology should be much more vital than the political one. Lamentably, numerous projects aimed to localize production and promote import substitution are economically unviable today.

The specifics of the Russian market are so that 60-70% of economically active enterprises are either state-owned companies or projects involving the state in some way. Therefore, the introduction of regulations for import substitution and requirements for access to the public procurement market discriminate international companies.

For example, very few international companies can accept conditions set out in special investment contracts, as their provisions are not working for them, and the relevant legislation envisions conditions that, in fact, restrict access to the market.

The localization of foreign mechanical engineering companies relies upon economic feasibility, which is influenced by the two factors: the size of the local market and the cost of production, including the cost of components, logistics, workforce, components accessibility and regulatory burden.

Most certainly, localization in mechanical engineering will be oriented to the local market, to start with. It is very important that the government contributes to the development of Russian suppliers, not only by pouring money, but by training how to integrate into international supply chains. For example, the clusters and special economic zones promoted by the Ministry of Economic Development.

Regions enjoy a reasonably high level of interaction between business and local authorities. At the federal level, the government is placed under certain circumstances, so it needs to carry out the development program.

The cardinal thing is that everything should be economically weighed. Often the following situation develops: different regions and state-owned companies attract three different investors for the same market segment, the investors build factories, and the factories do not function as a result. This is another argument to prove that any program of localization, establishment of production lines should be economically viable.

How to effectively develop science and take after innovative trends (digitalization, IoT, energy efficiency)?

Instead of reinventing the wheel every time, the most rational is to integrate. It would be advisable to evaluate methods of interaction with international companies.

Yes, in the Soviet Union the scientific knowledge, which had been forged for decades and centuries, was unparalleled. Nevertheless, it almost vanished and disintegrated, lacked funding and eventually broke up into multiple sold off assets.

The attempts made over the last six years, such as Skolkovo, are undeniably valuable, but too much was destroyed 15 years before. Therefore, global interaction is ever so important.

Unfortunately, the current political climate disables some channels of interaction; some still stay open, though. Intellectual and scientific potential of the Soviet era has been preserved anyway. Russia has advanced IT sector and nuclear industry.

Rosatom is a prominent example of science, innovation, and engineering development. Sadly, not all industries show such versatility. Therefore, strategic evaluation of the areas where science needs to develop is significant.

It is worth to focus on the areas relevant in terms of production costs, the state of affairs in Russian industries and the needs of the economy.

Is Russia ready to develop and implement innovations in training specialists? How acute is the personnel issue in this area? How would you rate the level of education?

The most important thing the Russian education system is missing is business orientation. There are many strong national economic and legal programs; fundamental and applied sciences are well taught.

The problem is that these sciences are not taught with a business twist and there is no understanding of B2B, B2G and soft skills.

“The most important thing the Russian education system is missing is business orientation”

We learn classic B2C marketing, but in Russia B2G marketing is also relevant, it sees it important to constantly study legislation practices and changes. This is taught to a lesser extent.

Theoretical groundwork is solid in this country, but the practical application of knowledge endures a great deal of difficulty, for instance, problems teaching such concept as product development. Knowledge of these processes provides insight into many criteria: by environmental impact, by product life cycle, by production specifics.

There are problems in building learning programs as well. We joined the Ministry of Education and Science several years ago to conduct a survey in the Foreign Investment Advisory Council. I coordinate the innovative development group in the council, and one of our activities is development cooperation with universities.

We surveyed companies and they, in turn, distributed questionnaires among universities to learn how interaction should be. We criticized the programs by universities, but when we had a chance to revise them, we faced the fact that we were inept to write programs. We know how to engage graduates effectively, to encourage them to complete specialist education: a year ago, we opened an innovative education center, where thousands of students have already been trained.

Would it be advisable for us to attract specialists from abroad?

Most certainly, yes. Any international company prefers to hunt specialists rather than buy ready-made businesses: it is more profitable, cheaper and less risky. With all the restrictions, with the existing intellectual property rights, still good specialists are the carriers of knowledge.

For example, China has advanced this way. The Chinese diaspora is very strong in the US and Europe. China was clever enough to create auspicious conditions to attract this diaspora back, and along with it deep practical knowledge returned to the country.

Unfortunately, Russia has no good reason to blow the trumpet. When Skolkovo began, it aimed to bring back our diaspora from abroad, however, sadly enough, a proper mechanism was not generated. I know hundreds of Russian emigrants, who would be happy to share knowledge, deliver lectures and benefit their country. Aside from acclaimed university researchers, Russia would take advantage of knowledge obtained directly from professionals who have previously worked in a corporate environment.

Instead of guaranteeing easy entry, simplifying visa application, the government introduces more requirements, impracticable in many instances, thus building greater barriers for the development of such collaboration.

We want mitigation measures and mutually beneficial conditions to attract the Russian diaspora. After all, many talented Russian scientists and technical experts relocated starting from the 1970s through to the 2000s. To develop innovation, Russia strives for fresh-minded natives, enriched with global experience. This is a different level of trust at the absence of language barriers.

Does the innovativeness of companies depend on how big is the funding allocated annually for innovation? How much does ABB spend?

There is a direct correlation. Our company invests about $1.5 billion a year in R&D. This is R&D funding alone. Again, there are project management, engineering, marketing of new products and integration.

For example, we are building an offshore oil platform; it uses and integrates new technologies by both our company and our suppliers. The expenses are not available, though they are not included in the $1.5 billion.

Interpreted broadly, innovation requires more than 10% of ABB revenue. The multiplier effect is likewise critical. The knowledge that we share with integrators and co-integrate further on is kind of innovation.

I am glad that recently the number of Russian integrators have increased, for example, in the oil drilling industry. Today, we are the world's largest manufacturers of electric motors, including specific motors that can operate from 50 below to 50 above zero and beyond, for the oil and gas industry, where explosion-proof design is required. This cutting edge equipment that requires high-tech production accordingly.

There are no miracles, one way or another, innovativeness is determined by the resources that are allocated to it.

“Any international company prefers to hunt specialists rather than buy ready-made businesses: it is more profitable, cheaper and less risky”

Airships. Back to the Future

Disputes over the use of airships have been continuing for the second century running. Experts continue to weigh up the pros and cons of using airships. On the one hand, it is a relatively inexpensive way of air transportation, but on the one hand, it is necessary to make huge investments required for creating infrastructure. However, the tendency towards developing new airships remains alive and well.

The Beginning

It is considered that the inventor of airships is Jean Baptiste Marie Charles Moynier. Konstantin Tsiolkovsky is a person who made significant contribution to the development of airships in Russia. He was the first who created a technically sound project of a large cargo airship that was carefully examined by soviet specialists in the 1930s. The golden age of airships was in 20s and 30s. The Dirizhablstroy company, est. 1931, produced more than a dozen aircrafts, but almost all were either broken or destroyed. The airship era came to an end in 1937 after the Hindenburg disaster. The German passenger airship LZ 129 Hindenburg was the biggest in the world. The disaster killed 36 people. This drew a wide response in society and ruined the reputation of airships. By 1940s, the production of airships was stopped in the Soviet Union.

"Unfortunately, in the XX century airships were not widely used, as we would like them to be. Airships faced strong competition from airplanes. In addition, airship performance were unsatisfactory in fact. Aircrafts were very imperfect in the last century, mainly, due to problems with stability, controllability, maneuverability, complexity in operation. Therefore, the development of new technologies leads to imposing new requirements on these airships. New airships have much more promising specifications than the ones invented in the last century," Chief Designer at Aerosmen, an engineer and aircraft builder, Orfei Kozlov says.

Benefits and Drawbacks

Plants were shut down, but those designers who really wanted to create an airship worked on over the project. Despite spoiled reputation, the invention had a number of advantages.

Firstly, airships can lift any cargo. But it mainly depends on dimensions of an airship and its strength. They can operate during a long period of time and cover long

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distances. The most attractive and useful thing is that airships can deliver heavy, large, and non-standard cargoes door-to-door. From a manufacturer's door to a purchaser's or a consumer's door, including loading and unloading," Orfei Kozlov says.

Another advantage is small fuel consumption that significantly reduces the cost of flights. In theory, the cost of transporting goods can be reduced twice in comparison with helicopters or airplanes due to small fuel consumption. It means that airships are environment friendly kind of transport.

Aeronautical aircrafts do not require a runway, so they can easily become the basis for a fundamentally new transport system in regions with no special infrastructure — roads, ports, airfields. Unlike helicopters, airships have a smooth running, which creates comfortable conditions for the transportation of passengers.

According to experts, airships are quite reliable and safe among other aeronautical aircrafts. Now inert helium is used instead of explosive hydrogen. In case of damage, they can smoothly land on the ground.

An airship won't fall as a plane even if its engine stops working, covering is damaged or helium leaks. Its construction is based on a circle, that is why it falls slowly and safely to the ground like a parachutist. Even if an airship hits the ground passengers won't be injured," Orfei Kozlov says.

Today airships are on the way of innovative development in transport and logistics. There is a transition from small blimps, so-called 'soft' airships, to more semi-rigid or rigid systems. Unfortunately, Russia cannot compete in this area, but we can solve relevant tasks in transport and logistics. Airships can unload dry cargo ships in the roads or other huge vessels. When a vessel is on the Northern sea route, it takes 20-30 containers and carries them to a transport hub. If necessary it transhipps cargos to trains. It can even deliver a container door-to-door if necessary. In my opinion, we can become a competitive player in the world. As far as I know, Orfei Kozlov's project is 70%-80% completed. The project was transferred directly from LocomoSky. A lot of wind tunnel tests were carried out in the Central Aerohydrodynamic Institute. Many mathematical models were developed and carefully examined there. Gennady Verba has managed to achieve greater progress in this field. The matter is how competitive we are now. If we spread our wings and airship will become popular in Russia.

Sergey Bendin,
Acting Head of the Moscow branch of the Aeronautics Commission at Russian Geographical Society

Among the main disadvantages are low speed (70 to 160 kph), bad maneuverability, difficulty of landing, dependence on weather conditions, high maintenance costs and lack of the necessary infrastructure.

However, the development of modern technologies allowed to solve some of these disadvantages, or turn them into advantages. For example, Zeppelin uses airships as air limousines for entertaining flights when high speed is not required.

Development of Airships Abroad

According to Russian designers, there is an undeclared race of airship building in the world now. Space technologies, new engineering solutions and materials are applied in modern models of airships. China is one of the leaders in the aircraft construction market today.

"China is one of the leaders in the production of stratospheric airships. The idea is quite simple: if an aircraft reaches the height of about 20 km. Wind speed at this altitude are lower than in the lower layers of the atmosphere, the atmospheric energy is also lower. The energy from solar batteries allows the airship to resist winds, and maintain a certain geostationary position for a very long time. Russia, the United States and European countries expressed a keen interest in this idea, but only China has managed to make an effective prototype. The other countries canceled the program due to various reasons. The year before last, China successfully tested the first prototype, and now this technology is being developed there," Gennady Verba says.

The necessary infrastructure has been established in the People's Republic of China. One of the world's largest slipways for airships with a gate height of 120 meters. According to experts' opinion, China will maintain its leading position in stratospheric, freight, and small advertising airships. In 2016, test flights of the world's largest aircraft Airlander 10 took place at Cardington Airfield in Bedfordshire, England. During the second test flight, the airship spent 19 days in the air without refueling and crashed due to a pilot error. The airship cost is estimated at 4 million dollars.

Hybrid Air Vehicles announced its plans to produce the first ten copies of Airlander 10 by 2021, and then started developing Airlander 50, a 50-ton cargo airship. Lockheed Martin has already contracted 15 airships. By 2019, the company plans to launch the first 20-ton aeronautic aircraft. Sergey Brin, a co-founder of Google, is working in one of the hangars of the NASA's Ames Research Center.

The Pentagon is also involved in developing airships — it creates small aerostatic aircrafts and tactical purpose airships, and designs stratospheric vehicles of strategic purpose. Zeppelin LuFtschiFFtechnik GmbH (ZLT) has four airships that are used for advertising purposes, pleasure flights and monitoring traffic. Deutsche Zeppelin-Reederei uses airships to transport tourists and transportation of special cargoes for scientific purposes.

Thales Alenia Space announced today the official kickoff of its Stratobus research & development project. Stratobus is an autonomous stratospheric airship that was just approved by the French government's "investment in the future" program. The amount of investments is 17 billion euros. Stratobus will be positioned at an altitude of about 20 kilometers (12 miles) over its theater of operations. Stratobus can carry payloads to perform missions such as the surveillance of borders or high-value sites, on land or at sea (videosurveillance of offshore platforms, etc.), security (the fight against terrorism, drug trafficking, etc.), environmental monitoring (forest fires, soil erosion, pollution, etc.) and telecommunications (Internet, 5G).

We pay special attention to projects, but at the same time, we have a skeptical attitude to this, as there are strong winds and no infrastructure in Siberia. To put it seriously, aircrafts can become a good alternative to helicopters, not airplanes. Our optimism is cautious due to many reasons. For example, it is necessary to build slipways due to a critical dependence on the wind. This is why airships cannot compete with helicopters now. Although some experiments were carried out in Moscow. Police airships operated in 1990s are unpopular now. As a rule, I can see aircrafts near Moscow. It's sort of the level of entertainment. It has good potential in this regard. It would be interesting to become a passenger of an aircraft, which is lighter than air. It is probably a different feeling rather than fly on a hot air balloon. It gives you more controllability.

Gagik Grigoryan,
Director of Analytical Department at UTAir

"In 2020, the market for high-altitude pseudo satellites, or HAPS, is estimated at one billion dollars from now to 2020, but is awaiting a product. With Stratobus offering a field of view of 500 kilometers, we're convinced that it will win a large share of this market," said Jean-Loic Galle, President and Chief Executive Officer of Thales Alenia Space.

Thales Alenia Space and partners plan to launch a demonstrator model in 2018, followed by the first qualification and certification flights in 2020.

Airships in Russia

Russian experts believe that airships might become the hallmark of our country.

"We can say that Russia is one of the leaders in this field today. Maybe, thanks to our common efforts," Gennady Verba adds.

RosAeroSystems sold its products, including five airships, in 14 countries. According to Gennady Verba, RosAeroSystems produced every second airship in the world 15 years ago. In 2003, Former Moscow Mayor, Yuri Luzhkov, purchased several vehicles for the Center for Road Traffic. The inventions were planned to be used by the traffic police for road patrol, but the project was terminated.

At the moment, our specialists are working on creating heavy cargo-and-passenger airships. RosAeroSystems have constructed five types of airships for 27 years. One of the most ambitious projects of the company is Atlant, a new type of aerostatic transport aircraft.

Atlant is not an ordinary airship. It has specifications of an airplane, a helicopter, and even a hovercraft. It is a multi-purpose vessel that is adapted to work without special infrastructure under unfavorable conditions. Moreover, it is necessary to build hangars, masts for airships and hire special crew. Those airships that we managed to produce and unveil are in demand. They have their own niche, but anyway it is exotica. Atlant and other similar inventions are not perfect and have a number of competitors in the world. I can't say that it is an avant-project. However, it is developed dynamically. The issue of financing is still being discussed. The current

economic situation is not very favourable than it was earlier. Despite this, we made investments, and Skolkovo Fund was our co-investor. The center helped develop the system of autonomous ballasting. Thanks to this, Atlant in a horizontal flight can be a lighter than air. If necessary it can get rid of 'lifting force', become heavier and touch down. We also have a number of advantages when maintaining the airship. In general, Atlant is a quite clear aircraft for us. In my opinion, the project may be realized in 3-3.5 years," Gennady Verba notes.

According to head of RosAeroSystems, a several billion investment will be enough to create a prototype. The carrying capacity of the smallest prototype of Atlant-30 is 16 tons with an effective range of 2,000 km. The carrying capacity of Atlant-100 is 60 tons. It is mainly used to deliver goods to hard-to-reach regions without infrastructure and harsh climatic conditions. In addition, aircraft hangars are not required. RosAeroSystems designers created an airship for sightseeing flights. Now it is mainly used for industrial monitoring and other tasks not related to tourism.

"Last year we carried out a trial flight for the first time and agreed with the leaders of the Russian city of Suzdal, one of the main tourist destinations, that flights will be made over the city. I don't know whether we manage to implement the project this year," Gennady Verba notes.

Aerosmena has worked out a project of a multi-purpose aircraft with a removable 60- and 120-ton-platforms. This construction allows to use the aircraft for transportation of goods and passengers. The airship has a lenticular shape and is equipped with 8 engines — 4 engines of horizontal traction and 4 engines of vertical traction. Depending on functionality, the cargo platform in the lower part of the airship can be replaced. According to Chief Designer, Orfei Kozlov, the model could be used for various purposes.

As you know fires in the Far East, Siberia were fought with the help of the Beriev Be-200 watershow that dropped 10 tons of water at full speed. The main problem is that water evaporates, or simply does not hit the target. As a result, the level of effectiveness is extremely low. The aircraft drops 120 tons of water at a time. And one more important thing, an airship should not be directly above the fire when dropping water. The level of effectiveness would be much higher. We have already offered EMERCOM to implement this project. EMERCOM strongly supported the project due to problems with financing the project implementation was delayed. We need no development researches. Everything is ready. It will take us two and a half years to create the first model. However, we need a 2.5-billion-investment to implement the project. That is our task. We intend to create an airship to send shift team to hard-to-reach regions where minerals are extracted. Energy batteries on board would power drilling mechanisms, as well as provide shift workers with the necessary housing conditions. Shift workers could live in this 'flying house' and perform industrial tasks," Orfei Kozlov concludes.

It is quite possible to develop a system for creating airships. As far as I know, such a commercial project has already implemented in the UK. It is a very thought-out project, so I hope it will be successfully realized. The situation is a bit different in Russia. The main problem is that we have no infrastructure for airships. In comparison with airplanes, airships need less infrastructure, but now it is not enough. I cannot help noting such an important thing as specifications. There are various climate zones in Russia: tropics, subarctic, and zones of extremely low temperatures. It is important to test how these inventions operate in various conditions. Legislation is another important thing. It is also possible that some amendments should be made in the legislation. It may take a lot of time — a year or two.

Konstantin Demanov,
Deputy Sales Director at Aeroflot — Russian Airlines

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Prospects

Experts are convinced that airships are an important element of the air transport system that can close the existing gaps and solve the issue of logistics in Russia in remote regions from economic centers. Sergey Bendin, Acting Head of the Moscow branch of the Aeronautics Commission at Russian Geographical Society, suggests using airships to solve cross-border shipments.

"There is a big problem: it takes long to deliver parcels from China to Moscow by land and by rail. The direct vector would improve the current state of things. Within a day and half a parcel from China will be delivered to Moscow," Sergey Bendin says.

Gennady Verba noted that those people who are interested in exotic trips can travel by air yacht.

"I have already mentioned that Atlant can touch down on the water, take off from the port, land in another port, field, etc.," the expert notes.

Russian designer, Orfei Kozlov, considers that airships can help carry out unique transportations.

"The Kerch Strait Bridge is being built. As you know, upper supports are put on piles. Now we can produce huge pontoons to carry and raise these parts. It takes a whole day," Orfei Kozlov believes.

"An airship with the appropriate load capacity can carry and install this support quickly and inexpensively. It can also replace a reactor on a submarine, as well as provide Chukotka or Kamchatka with electricity. The implementation of the Great Silk Road project will not do without airships," he added.

According to experts, some business representatives and governments of different countries are ready to buy such innovative projects. Everybody is interested in a finished product, not making investments in development projects. This is the reason why even the most promising ideas still have not been implemented.

Russian Seeds Sprout Innovation

RB Partners and EY report that the Russian venture market hit $894 million in 2016. The Strategy Journal presents the five finest innovation projects in the financial, agricultural and industrial sectors by GenerationS.

Conductive nano-inks for printed circuits

Developer: — AkKo Lab LLC.
Venture capital: 15,000,000 rubles.
Total private investment: 110 million rubles.

About the project. The unique printed electronics technology applies conductive circuits on flexible substrates such as textile and paper. It can be challenging to do it using conventional techniques. This technique is cost-effective, since it limits operations to two or three, whereas the operations rate in the conventional electronics industry may reach ten to twenty processes.

Relevance. The printed electronics market today is hundreds of companies worldwide, including such giants as LG and Samsung. World industries adopt printed electronics, therefore, securing the market's quick growth proven by market studies from leading consulting companies. AkKo Lab ascertained the real growth rate in Berlin, at Printed Electronics Europe, the world's largest industry exhibition.

It took the company over five years to develop and test the conductive nano-inks, silver, gold and platinum. Fujifilm Dimatix ran product testing in Santa Clara, California, and certified the ink. Fujifilm Dimatix listed AkKo Lab as one of the total twelve recommended manufacturers, and Russia's first.

AkKo Lab successfully printed prototypes of gas sensors and printed circuit boards, designed and manufactured elements of printed electronics.

Today, AkKo Lab is the only Russian company that produces and markets metallic nano-inks for flexible printed circuits in France, Spain, Sweden, USA and South Korea. This taking place in intense international competition. The Russia-produced nano-inks have received reports from abroad: biggest online media resources focus on the news and achievements of the company.

We now face an ambitious challenge to scale up the production of nano-inks, arrange large shipments, make good profit and market internationally. This requires building partnership, and we are always open for constructive cooperation. Our team's performance and competence guarantees investment from an angel investor for several years now. We believe that in the near future flexible and portable electronics will be embedded into clothing. Devices built into everyday things will be all around, and Russia will be a competitive high-tech country in this future. Today is the day we must develop the domestic market of printed electronics, look for new applications and develop productions.

Vitaly Kim,
printed electronics project manager, AkKo Lab

Cyber security platform — Oz Forensics

Developer: Artyom Gerasimov.
Venture capital: $100,000.
Estimated market value: $5,000,000.

About the project. Oz Forensics is a platform for countering digital fraud. The developers have created unique pattern-recognition algorithms for verifying the authenticity or lack of it of scanned documents and photos. The technology identifies digital forgery in less than a second. The platform's recognition accuracy is 98%. It includes three modules: Oz PhotoExpert recognizes digital forgery in scanned documents and photos, Oz Biometry identifies and verifies the client's biometrics, Oz Text recognizes characters in passports and IDs, and fills them in the client's profile.

Relevance. Oz Forensics platform is designed for banks, insurance companies, payment systems, microfinance and other businesses using electronic document management systems and working remotely with clients. Digital documents are checked for forgery, the clients are recognized using biometric algorithms.

The platform effectively detects scammers in credit and guarantee processes, where a banking institution can face serious monetary and reputation risks. Insurance companies are most exposed during underwriting and claim settlement. Perpetrators try to get money for non-existent damage to vehicle. In payment systems, they can use a stooge, a look-alike of the person in a passport, or insert another person's ID picture into an image for selfie verification, thus providing access to it. The platform identifies such cases when documents are submitted, which reduces the risk of digital fraud, saves budgets and client resources.

Oz Forensics statistics and business cases show that forged documents make a 10% share in the digital document circulation, as revealed by investigations. The cost of damage depends on the business activity. Oz Forensics saved its customers about 10,000,000 rubles, and the savings continue to grow. Investment in this product returns to the customer after a few months of use.

Today, we do not have a direct competitor in the market; there are just some functional equivalents of one or two our modules. We, however, provide a comprehensive range of solutions to immediately covers several pressing tasks from customers. Our algorithms show high accuracy and speed, and the solution is fully automated.
A special base of criminal scenarios and most used image editors helps recognize professional imitations. We save 20% of the resources our customers use, and 60% of the time their staff spends. Now we pursue an expansion to the markets of Europe and CIS countries as the client interest grows. The regulatory policy in countries of these regions grants remote customer service. Not so long ago, we took part in FinTech Summit ICT Spring 2017 in Luxembourg, where we got valuable partnership offers and replenished our client portfolio.

Artyom Gerasimov,
founder and CEO, Oz Forensics

Robot Control Meta Language

Developers: Mikhail Tyulkin, Dmitry Sutormin.
Venture capital: $1,000,000.
Estimated market value: $980,000,000 by 2020.

About the project. RCML helps to program adaptive robotic cells flexible to changing conditions, production priorities and demands. This effect is called automatic reconfiguration of workshop equipment (production line).

Relevance. The basic principle of RCML is to program tasks, not robots. A program written in RCML is tolerant of environmental changes and varying number of operating robots. It works equally well with mechanisms from different manufactures. This is consistent with the basic principle of Industry 4.0; software is independent from the type and number of robots.

Moreover, RCML is a universal gateway to integrate an industrial robot with an external system (e.g., an enterprise management system) or with software generating production task flows.

RCML reduces the time required for programming, reprogramming or modifying software by four-ten times. The effect is most noticeable for those industries that must reprogram robots frequently: these are the enterprises producing small batches or implementing projects that demand adjustment to external conditions. Reduction of production costs depend on the share of robot programming cost.

KUKA AG, a German industrial robot manufacturer, promotes RCML and has included it in the list of approved software options with the aim to make it available through its sales channel. By KUKA estimates, this will generate more than 100,000 sales in 2018. RCML project is another brick in the Future Factory at the National Technology Initiative. The company's target customers are manufactures who use or intend to use robots.

We see system integrators, robot and robotic accessory manufacturers among our partners. To them, we offer a special partner program and support. Now our product is under Due Diligence investigation by KUKA, the process consists of three stages, at the moment we do the second, certification and packaging. We carry plans to launch similar partner programs for other major manufacturers of industrial robots.

Mikhail Tyulkin,
director, RCML LLC

ScanDerm Pro, portable skin analysis system

Developer: Evgeny Sobolev.
Venture capital: 200,000 rubles.
Estimated market value: 60,000,000 rubles.
Estimated unit price: $200.

About the project. ScanDerm Pro is a device and an app that analyze skin condition. The device measures main skin parameters, predicts wrinkles, pigmentation and other cosmetic defects. The device and mobile application help monitor skin condition, build reports on problem areas, learn about potential problems and get individual guidelines on skin care.

Relevance. The technology in use detects skin problems accurately. It uses three measuring techniques: spectral analysis, galvanic skin response and vacuum suction nozzle for measuring skin elasticity. The device saves time and money while giving professional advice a dermatologist or cosmetologist could give, and helps find an effective personalized skin care program. The developers will also add to the mobile application a special option — a paid subscription feature for remote expert advice.

On behalf of the Ministry of Industry and Trade of the Russian Federation, Roskachestvo and ScanDerm Pro held a working group meeting on this method of skin analysis, followed by relevant studies.

Backed up by the Ministry of Industry and Trade and the Perfume and Cosmetics Association of Russia, ScanDerm Pro has plans to amend the Customs Union regulation on the safety of perfumes and cosmetic products, and legalize a new method for cosmetics quality control methods.

ScanDerm Pro is working on first orders from several startups of the State Research Institute of Genetics. The device is at a prototype stage, the production is yet to start.

The device is easy to operate: to analyze skin it only requires a mobile application. First, you take a photo of a problem area using the gadget with an optical system, then collect data using the vacuum suction nozzle and galvanic skin response meter built into the device. The image is then software-processed; the decrypted information is displayed on a mobile device. There are several analogs to the device, such as the recently announced S Skin and Lumini by Samsung or the smart HiMirror. However, ScanDerm Pro has several advantages: it identifies skin problems more accurately, renders analysis of any areas, including scalp and hair, not just face, and it draws individual programs for safe sun tanning, depending on skin type and condition and location of exposure. Besides, it is portable.

Evgeny Sobolev,
founder and CEO, ScanDerm Pro

Manufacture of green technologies

Developer: Anzhela Asaturova.
Venture capital: 3,000,000 rubles.
Prototype completion: 4 years.

About the project. Three new bio-fungicides based on good bacteria: bio-fungicides protect plants from fungal diseases. The offered biologics are an environmentally safe alternative to chemical pesticides and fertilizers. This is a B2B product. The end users are farmers and agricultural businesses engaged in cultivation of crops.

Relevance. Bio-fungicides provide effective protection against economically important diseases of fruit, cereal, vegetable, and berry crops. The product reduces costs, increases yield and guarantees healthy crops.

Bio-fungicides reduce production costs by three times for fruit crops, ensuring commercial quality of apples with zero post-harvest period before consumption. Fungicide treatment of seeds, vegetative cereals and soybeans makes it possible to obtain additional 10-25% yield as opposed to chemical pesticide treatment.

It is remarkable that, compared to chemical fungicides, the biopharmaceuticals of the Manufacture of green technologies, apart from protective effect, have growth-stimulating effect and a wide application range.

The biologics are considerably cheaper than comparable chemical alternatives, and they secure extra yield. Besides, they reduce pesticide pressure on soil, and facilitate production of healthy foods.

The developers work in the microbiological plant protection and collection lab of the All-Russian Research Institute of Biological Plant Protection in Krasnodar.

The analysis of cost-effectiveness from using the bio-fungicides is carried out in farms in Russia and Kazakhstan: Verkhnedubovskoe, Novobataiskaya, Skif, Sady Sibiri, Sad Michurintsev, Strukov, Krasny Sad, Baiserke Agro.

Today, the project is at the scale-up stage. It is in transition from laboratory regulations to regulations for biopharmaceutical production using fermenters. This will enable developing a technology for obtaining bio-fungicides, which can later be used to scale-up the product for commercial release. Currently, the new biopharmaceuticals are tested in different regions of Russia (Krasnodar Krai, Stavropol Krai, Primorsky Krai, Rostov Oblast, Novosibirsk Oblast) and neighboring countries on cereal, fruit, vegetable, berry crops and potatoes. We are exploring ways to introduce our biopharmaceuticals in the Eurasian Economic Community before everything else, since the pharmaceutical product certification and registration system is identical all over the community.

Anzhela Asaturova,
director of the microbiological plant protection and collection lab, All-Russian Research Institute of Biological Plant Protection

Megatrend: In Science We Trust

Alexander Dolgov, a Professor at Novosibirsk State University and Director of the Center for Particle Physics and Astrophysics, a Doctor of Physical and Mathematical Sciences, a laureate of the Landau-Weizmann, Pontecorvo, Fridman, Markov prizes, commented on the practical role of fundamental science in the example of space exploration.

It is either difficult to assess the practical role of fundamental researches, or simply impossible. Apparently, Michael Faraday is often cited in a response to the statement on the application of his studies, regarding iron filings around magnets. “There is every probability that you will soon be able to tax it,” Faraday said. And it turned out that way. Space exploration is the search for something unknown. In any case, there are still some unexplained phenomena in the world. Meanwhile, detection satellites and new telescopes are put into operation. The cost of the latter is about a billion dollars per piece. The construction of a new telescope with a mirror of almost 40 meters started in Chile, and the best radio telescope in the world was designed in China. Gravitational waves have been detected. The two interferometers that helped to make a discovery are estimated at half a billion. We are wetness to a boom in the field of creating new ultrasensitive devices. The general motivation: do what you must, come what may. If you do not look for something new we will be doomed to failure. There is an active search for new forms of life in the solar system, and far beyond. The most important reason is to receive knowledge about new forms of life and other civilizations. The search for new planets of the solar system will indicate where to move on when the Sun turns into a red giant and swells almost to Jupiter. The Earth will burn to ashes.

Another technological breakthrough may come from information of extraterrestrial intelligence. Technological breakthroughs as by-products for designing new precision instruments have already been and will certainly be. History shows that it is not in vain. Cosmology will help to find the answer to the excessive dependence of mankind on hydrocarbon energy carriers. Speaking about dark energy, which is about 75% of the mass in the universe, the idea of extracting this energy for the needs of the “national economy” is even more stupid than works on obtaining sunlight from cucumbers, described in one of Gulliver’s travels. It is important to implement reasonable ideas when exploring space. For example, to create satellite-mirrors that would focus solar energy and re-radiate it to the Earth, or to extract helium-3 on the Moon for thermonuclear stations. There is also a semi-fantastic opportunity to find magnetic monopoles in space that can catalyze the decay of a proton. This may become the easiest way to receive energy. But all this won’t happen in the near future.

Text: Maria Voyscheva,
Darya Kichigina

Science Makes Rules

What is the role of research and development in information technology, pharmaceuticals and space industry? What tasks are set for R&D departments today? What support measures are needed to improve R&D efficiency? Representatives of Roscosmos, IBS and MSD speak about the role of research in business strategies.

Mikhail Simonov, Deputy Director
of the Strategy Planning Department,
Roscosmos Corporation

Research and development activities promote sustainable innovative development of Russia's space program, enhance its competitiveness, and evoke to tackle strategic tasks of improving space rocket systems for the national security, social welfare, economy, science and international cooperation, give Russia guaranteed access to space, secure the nation's share in the global space market. The orbital constellation growth rates, technical level and competitiveness of artificial space objects, reduced time needed to construct space rocket equipment, increased quality and reliability — these affect the status, relevance and impact of R&D. The first stage of developing space rocket equipment incorporates system analysis and relevant studies to identify and solve design and technological problems, and draw detailed technical specifications.

Any development project requires a framework with clear prognostic assessment of the role and place of a proposed design, its due date, cost and customer demand. Ensuring that space rocket equipment has world-class technical specifications is one of the critical tasks for a development project. To this end, new technologies are being developed to design key elements of space rocket equipment, including main components of marching liquid-propellant engines for prospective carrier rockets, new structural and functional materials, unified series of smart sensors, measurement, monitoring, diagnostics and emergency protection systems for space rocket equipment, ground technological facilities, hardware and software complexes for data processing using mathematical modeling, space systems for flight testing of advanced on-board gear and spacecraft systems, robotic systems and intellectualized equipment.

In order to improve the space rocket equipment performance, reduce timing and costs of development projects, and introduce new scientific, technical and technological achievements, an advance for basic technology and key components is established. It must ensure the development of priority devices and service modules for advanced space systems and

complexes of various purposes. There are three most significant innovative projects implementing critical technologies in the Russian Federation. For example, flight tests of the newest aerospace equipment culminated in the launch of Angara-A5.1L carrier rocket. The test flight of the models proved the chosen development strategy for launch vehicles and design solutions embodied in the Angara rocket family to be correct. The multipurpose space rocket complex Angara is a cooperative design and manufacture of Russian companies. The rocket launches will be carried out in the Plesetsk Cosmodrome, and potentially in the new Vostochny Cosmodrome.

Building the system using great Russian scientific and industrial capacity is a priority task towards the development of the national launching facilities system. In 2014, a system for tracking and monitoring mobile objects was introduced and mass production of search-and-rescue personal beacons COSPAS-SARSAT began. This enhanced the efficiency of maritime rescue operations in monitored areas. The development of smart monitoring systems and nondestructive testing of technically demanding objects contributes significantly to reliability, performance and safety of the aerospace industry and many other critical national industries that call for breakthrough solutions to boost the competitiveness of the Russian produce.

Capacity development for building an advanced space rocket technology with improved technical specifications is largely determined by timely establishment of a technology advance, which is the basis of new developments and productions. Early establishment of necessary technologies as a technology advance helps mitigate risks, reduce the cost and time frame to make space rocket equipment. Program-target planning and risk assessment of space projects are made using the PPBE formula (Planning, Programming, Budgeting & Execution) to enhance the R&D viability. The use of project management technologies and modern techniques for technology roadmap building makes it possible to increase the effectiveness of research and development amid risk and uncertainty. To diminish the risks of implementing innovative projects, state support is given through normative legal acts of the President of the Russian Federation and government decrees. These envisage including the projects in state targeted programs, and concluding intergovernmental agreements, since state support is a guarantee for investors and consumers that projects are be implemented. Priority budget financing is provided for particularly important ventures with high technical and economic effect, having a breakthrough cross-industry value. Russia is developing international cooperation in a number of innovative areas. A number of projects focus on collaboration with foreign countries, which reduces scientific and technical risks in creating advanced space facilities on behalf of society, economy and science.

Pyotr Dubenskov, Director for Product Development and Production, IBS

The role of R&D in IT has always been fundamental globally and in the Russian market. Information technologies today are a locomotive that hauls many other industries. Sometimes, technologies change their essence: now the widely applied term “uberization” means an IT-based know-how that dramatically changes the industrial landscape. In such manner, using big data analysis and other digital technologies, a company can comprehensively monitor the production life-cycle and conduct equipment maintenance and overhaul before failure. This, basically, brought the world to the threshold of the fourth industrial revolution. Robots and automated machines occasionally replace human labor in HR management and facilitate routine transaction processes in personnel departments, thus refocusing the staff from local to strategic business objectives. Digitization of relations between government and citizens will save both businesses and government agencies billions of man-hours. This is broadly practiced in the West, gradually moving towards Russia. These technologies are already in action, however, ten years ago very few technology evangelists had a discourse about them. The value of research and development increases in every industry, as greater added value tends to shift from the production phase to the design phase. This trend is strong in IT now more than ever. Our company's R&D practices generally focus on building engineering products comparable to foreign counterparts, in particular, on developing the Skala-R software and hardware products, which were introduced in 2015. Today, developers have potential for this: the hardware base is quickly becoming available to all players in the market, and companies that manufacture hardware are becoming suppliers of raw materials,

not products. The competitive advantage of products has shifted from the hardware level to the architecture and software level. The most important element of the R&D strategy for our company is to accelerate first steps (choose a hardware base for a new solution, run a compatibility check of components, configure software) before testing of a turnkey solution begins. You need to do these before competitors do. Moreover, we develop products built on the understanding that Russian customers will put forward challenges shortly. These can be either universal solutions, such as the Skala-R hyper-converged platform, which is comparable with most data storage and processing infrastructures, as well as special solutions tailored to the understanding of load characteristics while working with database management systems or real-time analytical systems.

The main difficulty we face in implementing this strategy is that we have to explain to customers that their tasks can be solved differently now, and everything new is shunned in Russia. Right now, this is what happens with hyper-converged platforms: the customer budget for data center equipment includes expense items such as servers, storage systems, network infrastructure, resource visualization, monitoring and security software. We, however, offer a product that includes all these components covered by the manufacturer warranty. Despite the obvious advantages of such solutions, together with the success of this approach in the Western market, Russian customers are cautiously considering it. We are certain, though, that within two years the number of deliveries of hyper-converged solutions will outstrip the number of delivered servers and storage systems.

Marwan Akar, CEO, MSD Russia

Pharmaceutical companies view research activities as an integral part of their mission. PwC estimates that investment in research and development in this sector make more than $140 billion. Only electronics manufacturers spend more, but they give way to drugs manufacturers by the R&D/Total Profit Ratio. The clinical approbation of candidate drugs accounts for the lion's share of these expenses. MSD Russia teams up with more than 350 research centres. More than 50 clinical studies of new drugs to treat diseases with limited therapeutic options are being carried out at this point. The diseases include cancer, hepatitis C, diabetes and cardiovascular diseases. This achieves socially significant and economic effect. Millions of people today live longer and more productive lives, including through innovative medicines and vaccines. Economists estimate that the OECD countries, where the average life expectancy grew by 1.74 in 2000-2009, experience most of this growth due to the emergence and improved availability of innovative medicines. Every other year to the average life expectancy contributes to GDP growth of 4%.

The development of innovative medicines is a costly, lengthy and risky enterprise. It takes around ten years and about $2.5 billion to bring an unprecedented drug to the market. Companies lay out specific requirements for research activities to guarantee significant clinical advantages of a newly developed product over existing treatments. This results in increased favorable treatment outcomes for patients, as well as decreased cost of medical treatment in the medium and longer term.

For instance, the Russian market has recently introduced so-called immuno-oncology drugs that shift the paradigm of fighting malignant tumors. These drugs significantly extend the life of patients with advanced-stage melanoma and lung cancer, while maintaining the lifestyle. To increase the efficiency of research and development activities, it is important to make sure that its results are accessible and are used to the greatest extent possible through the introduction of new technologies in the market of medical services. This will not only guarantee the full realization of clinical and economic advantages of these technologies, but will also help hasten the return of long-term investments and encourage the development of new drugs. In this regard, intellectual property protection and registration period for new pharmaceutical products are particularly important. The example of other countries suggests the possibility to shorten the registration period and include highly effective innovative medicines in positive lists.

For our part, we focus to cooperate with the government and the professional community, and willingly share our international experience. Hence, in 2016, we opened the Center for Expertise and Innovation in Healthcare in Moscow. Associated with leading institutions, it conducts comprehensive research on the impact of innovative technologies on the development of human capital in Russia and offers specific solutions that will help Russia achieve its healthcare goals.

Science Through the Eyes of Children

A lot of projects and programs dedicated to working with young people have recently been implemented in Russia. They are mainly focused on bringing up patriotic feelings and encouraging young people to receive several educations. Development of youth innovative creativity centers actively promoted the profession of an engineer. According to the Youth Development Strategy until 2025, it is necessary “to ensure the development of an innovative economy.” According to experts, the latter is impossible without progress in science. Strategy Journal shares the research “Science Through the Eyes of Children: The Draw-A-Scientist Test” with its readers.

Differentiated perceptions of different spheres of the labor market is an important aspect of professional self-determination. If high school students do not know what means to be an engineer, a logistics specialist, a logistician or an analyst, then they will hardly join these professions in future. Students may join the future profession under the influence of some other factors, in particular, the influence of parents, fashion, and other cases.

However, there is a high probability of disappointment and low motivation in future. All that has been said is also true for the profession of a scientist. It is accepted to single out two ways of forming the image of a scientist. Firstly, directly — through your personal experience from a research activity. Mainly, it is typical for professional scientists. Secondly, indirectly — through other people’s opinions and the media. Similar way of drawing the image of science is used by the youth of today who receive information mainly from the Internet and, to a lesser extent, from television, radio and print media. It worth noting that the majority of television channels, newspapers and magazines have websites, which form accessibility of the information environment in accordance with users’ requests.

Cartoons, movies, animated cartoons, comics and other non-verbal documents influence a younger generation. For example, first children’s notions about scientists and their activities are based on images in cartoons, children's informative TV shows, but unfortunately, they are often distorted and far from reality. Scientists are either ridiculous simpletons either mentally unbalanced villainous who are trying to destroy, conquer and enslave the world. At the same time, we can hardly call them successful. They are poorly socially adapted and they can hardly become a standard for modern children.

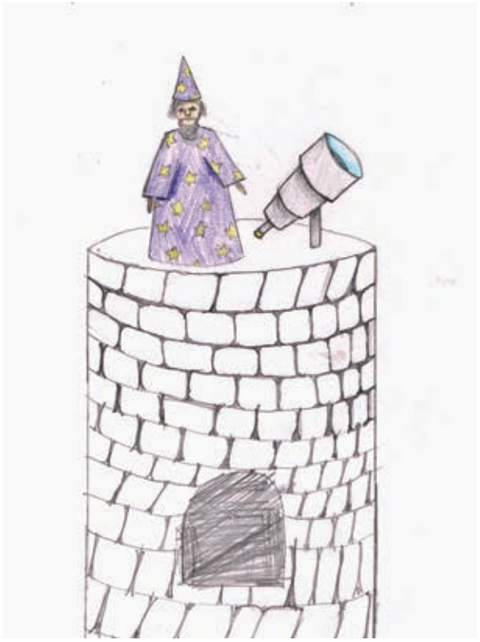
Thus, the following question comes up in our minds — what image of a scientist have formed in the perception of children in this connection. Content and certainty of the image of science, in addition to analytical work, intellectual potential and the desire to comprehend something new, help make a choice in favor of a research career.

The research was carried out at schools among 8-12 year-old-students in Yaroslavl. The Draw-A-Scientist Test (DAST) was used as a primary diagnostic tool.

Students were asked to draw a picture of a working scientist and then write a little story about the scientist. Their task was to tell about the scientist’s profession, give him a name, and describe his field of activity.

When analyzing researchers paid attention to stereotypic and some alternative criteria that were used in late works. The color scale, genre, and constitution of scientists were also analyzed in accordance with the typology of Ernst Kretschmer, whose classification system is based on three main body types: asthenic/leptosomic (thin, small, weak), athletic (muscular, large-boned), and pyknic (stocky, fat). The stereotypic image of a scientist is an ectomorph who devotes his life to reading books and carrying out researches.

Having analyzed the drawings it was found out that only 37.6% of the children drew a scientist in a lab coat when conducting laboratory experiments. Scientists often wore casual clothes, which could be seen from underneath their lab coats. In fact, a lab coat is not



a piece of clothing associated with the image of a scientist today. It is used by a rather narrow range of scientific representatives involved in laboratory researches. However, 13.3% of the children draw protective suits (fully or its separate elements — gloves and helmets); and 28.9% of the children did not draw any details, that is why we failed to identify what had been drawn. This result can be explained by the fact that children were not motivated to make a drawing of high quality, as a clear view of the specificity of a scientist have not been formed yet. In other words, the criterion of clothing children's drawings showed not stereotypical, but the real state of things.

According to the test, eyeglasses are associated with scientists, but above all with reading. Eyeglasses were drawn rarely (47,4%). The children added something like that to their drawings: “He has read a lot since childhood that is why he has weak eyesight now”, or “He spends all day long at the office. Thus, I can

suppose that he wears eyeglasses, as his eyesight is extremely weak". Eyeglasses, and the profession itself, are associated with poor health. Young scientists wear eyeglasses rarely in contrast to their older colleagues. In this context, eyeglasses start losing their must-have indication of a scholastic degree. A disproportionately large head (21.4%) or an image of only the head/face of a scientist (10.4%) may be an alternative criterion that indicates a scholastic degree.

Only 24.9% of children drew mustaches or beards. This fact also contributes to the revision of the traditional image of a scientist. Mainly, due to the fact that the Russian children drew a very large percentage of women scientists (15.7%) in comparison with children in other countries. Perhaps, it makes sense also to point out a new alternative criterion — hair standing on end (18.5%). This is a consequence of the media image of a scientist. Often a condition of hair help understand the scientist's age: a bald spot or gray hair (21.4%).

The most frequent stereotypic criterion in the drawings by Russian schoolchildren were symbols of research (test tubes, flasks, retorts) — 66.5%. It was quite a typical for children to say that the scientists on their drawings were chemists. However, when calling it that way schoolchildren did not draw neither equipment, nor tools, nor products of labor. Thus, the verbal description is not supported by the imaged object. Despite the fact that their scientists were astronomers or even philosophers, there were test tubes on the table. Thus, the contrary variant is also true.

The other most common symbol of research is a telescope. Other variants, including computers, manipulators, robots, appear in individual cases. This may testify sufficiently simplified and limited children's views about scientific specializations and types of work. Since a scientific activity is associated primarily with chemistry, however not all students liked this lesson at school. In future, this stereotype can prevent many gifted children from developing their professional skills in this scientific field. This viewpoint was confirmed by the children's comments. "This is how I see the work of scientists. It mixes different chemical liquids to find out the reaction. I am not interested in this work because I do not like chemistry."

Books significantly reduce their positions in the image of a scientist as the symbol of knowledge. Mainly due to new information technology in our life and professional activities. On the other hand, children do not know about such functions of scientific work, accumulation, systematization and transfer of knowledge. Scientists are users of knowledge that already obtained. It worth noting that computers were drawn rarely by the children (6.36%). There are no children of this age in Russia who do not use the computer one way or another. In cartoons and films, scientists use computers, but the subjective experience of children is impenetrable for such information. The profession of the scientist is perceived by schoolchildren as something special, fundamentally different from ordinary activity, and computers and all kinds of gadgets have become an integral part of many modern adolescents' lives. Children think that scientists, who cannot be like others, are 'deprived' of the opportunity to use the new technology, but quite often endowed with magical attributes. Some children drew not a modern scientist

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(17.9%), but a well-known scientific who lived long time ago: For example, Einstein, Mendeleev, Darwin. Thus, a scientist is a sort of unusual, old-fashioned, archaic person. As a rule, children focus on all new and modern and they will unlikely want to be join their life with this profession.

As a result of scientific work, it was recorded both material products (test-flask with liquid, robots, machines), and incorporeal results (ideas, insights), which in some cases existed together. The infrequent indication of a scientist's work results above all means low awareness of children in the field of communication among everyday objects with scientific discoveries and solutions, and secondly about the representation related to non-objectivity, the immateriality of scientific work.

Scientists' labor products were vividly represented in children's essays. Schoolchildren have polar attitudes to the results of research activities. It can be a strongly marked humanistic activity of a scientist, aimed at improving people's lives: "I drew a chemist. He is kind, smart and famous. He thinks how to invent an elixir of youth", "This great scientist was looking for the right formula all his life in order to make a cure for cancer. It seems that he achieved this goal by the end of his career. He works in the field of chemistry." It can be a destructive activity, creating evil. "My scientist is a villain. He wants to invent a machine to enslave the entire world," "Dr. Evil. He is engaged in biology and conducts experiments to enslave the world."

Symbols of achievements (medals, diplomas) were drawn rarely (8.1%). The profession of a scientist is not perceived as a possible area of professional success.

We often could not understand without a description that it was a drawing of a scientist. It was impossible to determine the level of a specialist's competence, sex and age (11.6%). There were a lot of drawings where we failed to determine the sex of a scientist. This means that the children have a little information about this profession, and have an extremely vague and abstract idea about it.

The research was carried out at schools in Yaroslavl in 2016-2017. The research was attended by 172 students, aged 8-12. The choice of younger adolescents was determined by the fact that it was early for them to make an obligatory choice of subjectively significant priority for their scientific career. They are about to start their journey into the world of professions. At the same time, participation in the technological environment (gadgets, household appliances, transport) from the early years allows us to build our own opinion about science, a scientific discovery, an invention as the source of all surrounding scientists and the natural and natural results of scientists' work. Understanding how students see the research activity and researchers, makes it possible to clarify, change and make targeted impact on the image of science in career guidance, future requests of the labor market and students' desires.

Yelena Volodarskaya,
Doctor of psychological sciences, associate professor, leading researcher of Vavilov Institute of the History of Natural Science and Technology of the Russian Academy of Sciences

Scientists belonging to the white race have been drawn by the students. Only one child drew a black scientist, explaining that he saw such a scientist in a foreign movie. In a number of cases, the respondents had an effect of the amorphous image of a scientist and his facial features. Sometimes scientists stood back (12.8%). Two drawings were without scientists. A girl drew a few animals and wrote: "A biologist. He has two rare fishes, two parrots, one cat and two snakes. They are one year old. He loves their pets very much." On the one hand, the absence of details says that the children have a very vague idea of this field of activity and its representatives. It is tied with an indifferent attitude, the absence of emotional richness in the

sphere of scientific activity for the respondents. On the other hand, the absence of details in the image of a scientist allows to focus not on the individual, but the activities and results themselves (e.g., formulas on the board). However, this leads to featurelessness of the science. A scientific progress is obvious, but it is achieved more on its own, rather than by research officers.

Children see a scientist as a lively and sensitive person, but this can be not only the result of personal experience or the absence of stereotypes, but the result of media influence: in many films or cartoons, scientists are represented as extremely emotional and even ecstatic, who rejoiced at the possibility of destroying the world in a hyperbolized form.

When completing tasks some students used only one color (often atypical — blue, green, lilac), for the whole drawing and also for drawing facial features. Despite the fact that the children could use ten pencils of different colors, 18% of drawings were monochrome, 43% of drawings were polychrome (six colors or more). Perhaps, the scanty color scale shows that the children had not enough interest in this professional field and its representatives.

The environmental analysis, in which the scientist was put by the children, showed that they have poor knowledge of the specifics of the scientific work, despite the fact that in the cartoons, telecasts and films the laboratories were drawn in detail. In most cases, the children drew scientists who observed stars through a telescope in the open air, less often biologists, despite the fact that astronomers conduct their observations indoors. Thus, children have a vague idea about details of scientists' work. The majority drew an alchemist with various test-flasks and tubes — it added a mythological aspect to the image of a scientist.

Children have an extremely low interest in science as a future version of the professional choice: "I think all professions are interesting, the main thing is to love what you do. As for me, I will not choose such a profession. It is very interesting and you can also learn a lot of new things, but I want a more creative profession.

It worth noting in conclusion that the image of a scientist is stereotypic. The students of the elementary school have poor awareness of scientists' activities that prevent from choosing such a profession. This low level of children's awareness can be explained by their young age and the absence of experience. However, if these children fail to meet with scientists in future, their ideas about this profession and representatives of the scientific community will remain at the level of cartoons and comics.

The Draw-A-Scientist Test (DAST) was used as a primary diagnostic tool. This methodology was developed and proposed in the works of David Wade Chambers. A large number of researchers around the world (Bolivia, Greece, Canada, Columbia, the United States, Turkey, Sweden) used this technique to identify generalized indicators of the image of a scientist, regardless of sociocultural conditions of people's lives, allowing us to describe stereotypic criteria for the perception of scientists, the scientific community, and their activity field in general. Traditionally, the image of a scientist is divided into seven criteria. Their presence in drawings indicates the stereotypical image: a lab coat; eyeglasses; mustaches or beards; symbols of research (tools and equipment); symbols of knowledge (books, card indexes); technology (scientific products); formulas and comments ("Eureka", "I have found").

Tatiana Razina,
Deputy Director for scientific and educational work of OANO VO, the branch of Moscow Psychological and Social University in Yaroslavl

Therefore, it is very important to involve children from an early age in the creative activities, create conditions for receiving experience in designing, modeling, research in all the diversity of scientific research. Absorbing in the world of science fiction, support and development of curiosity, fantasy, intellectual courage, riskiness, and openness to new knowledge will undoubtedly help support interest in science, form a scientific worldview, as well as enhance the appeal of research work. The most important thing is to solve the staffing problem of contemporary Russian Science associated with the influx of young gifted professionals who can improve the research potential and support the positive image of a scientist.

The researchers came to the following conclusion: the less stereotypic image of scientists is formed in the minds of students, the more probability they will have positive attitude towards science and subsequently they will build their career in the scientific field.

The frequency of stereotypic criteria of the standard image of a scientist in children's drawings

Criteria of perception		%
Stereotypic	Lab coat	37,6
	Eyeglasses	47,4
	Facial growth of hair (including beards, mustaches, or abnormally long sideburns)	24,9
	Symbols of research (scientific instruments and laboratory equipment of any kind)	66,5
	Symbols of knowledge (principally books and filing cabinets)	32,8
	Appropriate signatures	31,8
	Symbols of achievements	8,1
Alternative	Computers	6,36
	Male	76,7
	Belonging to the European race	99,4
	Elderly people	38,4
	Mystery	6,4
	Work in a laboratory	50,9
	Danger	9,3
	Casual clothes	24,7
	Smile	43,4
	Lamps	13,9

Gamification: Lessons Learned

Gamification has won enormous popularity over the last ten to fifteen years. It largely relates to systems of motivation, to Generation Y relations and personnel training. Is it a new craze or a necessary learning tool?

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Why gamification of the learning process is relevant?

In a broad sense, the expression “gamification” means using approaches that are typical for different games for non-gaming purposes. Is it applicable?

The major problem of modern corporate learning is inadequate putting knowledge into practice. Experts claim that only 11-30% of the lessons learned from trainings are successfully applied. Despite such a shortcoming, this format is ever developed as the most catering to the needs of employees. What is the reason?

The Moscow Career Center interviewed 116 professionals from Russian businesses. They responded about what influences the success of learning (2010 study). Student self-involvement in learning was called the key success factor (36%). The second most important factor is the qualification of a trainer (31%). 18% of the experts note the worth of managerial support and 15% believe that the quality of educational materials yields success. Another issue of corporate learning lies in the shortage of time to master material in an employee’s schedule.

Companies often forget that at any given moment they are in the hearth of competition for the employees’ attention. Social networks, media, TV shows — all of this distracts people from self-development. It is therefore necessary to struggle for the attention of staff, through gamification as well. Thus, this approach is a logical development of teaching methods.

Sergey Baiteryakov,
director of HR consulting department, Alliance Consulting, ACIG Group

Visiting and block-release training implies that students attend classes; however, they can fail to do homework or further reading. If you take a closer look at these two examples, you can see that the causes lie in the disposition of employees towards learning and in the subjective importance of these activities in the eyes of the people. This is where gamification comes into play. If we ponder about the learning process, gamification primarily aims to improve user engagement.

What gamification techniques look like?

Few examples of gamification techniques will help you understand how to use them in the learning process.

Storytelling. This technique assumes that the learning process turns into a coherent story. For example, courses and assignments are united by a common idea or scenario. Students find unravelling such scenarios extremely interesting.

For example, the project management course teaches step-by-step project implementation, and a student gradually learns how the story develops depending on the results of tests he (or a group) passes. The objective of storytelling is straightforward: to stir interest, add an emotional component, a desire to find out about the results of the work and complete the course.

Perfectionism. The essence is to create a much-differentiated scale for evaluating results and giving students an unlimited number of attempts to pass a test perfectly. Normally, to pass a test, you need to score 90% correct answers. This is no longer required. Many want to score 100%, though. Especially, having this technique combined with participant ratings.

The technique effectively improves involvement in the learning process. To simply pass a test, usually 2-3 attempts are enough; the best possible result requires up to 10 attempts. The established practice shows, students not only test themselves on one instance, but also re-read papers and painstakingly analyze previous courses to return and beat the test with 100% success.

Ratings. This technique effectively encourages students to timely and fully complete a program. It is important that the ratings be public and many in number. For example, it is good to have ratings by timing and ratings by points. Non-standard assessment practices can include the number of additional tasks performed, the number of books read, the assistance to co-workers in mastering the material. Such variety gives options to struggle for and win first places, which motivates participants.

Achievements and points. Students receive badges for certain actions or results. It is important to chart this technique so that these badges are awarded regularly and everyone knows exactly what else to do to get the next achievement. Yet, this is by far not all of possible techniques.

Should we consider gamification?

Any of the introduced techniques is not entirely new, in the learning process too. Why, at that point, is it reasonable to discuss a new phenomenon and even more to spend time on introducing new techniques?

First, gamification is only relevant when multiple techniques are joined, therefore, converting quantity into quality. Consistency, mutual support and the diversity of used approaches are crucial. Such techniques change the way course materials are taught, the learning program, the performance assessment and other important aspects of the learning process.

The second important part of good gamification is persistent measurement of the effect from the implemented methods and tracking results to adjust the use of the techniques. Thus starts the process of continuous improvement of the learning process.

If these two rules are followed, the further success depends only on how creatively gamification advocates promote it in the learning process. It is also noteworthy that gamification enhances conventional learning techniques: online learning and other.

Measured effects from the introduction show that the amount of time an employee takes to work with extra materials has expanded from 30% to 150%. Students absorb 18-27% more information. Learning satisfaction increases by 70-120%.

Thus, gamification should be viewed as the next step in the development of modern teaching methods. IT market research and consulting company Gartner forecasts that by 2018 more than 70% of Forbs Global 2000 companies will use at least one gamified application in the corporate development, including learning.

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