

THE DIGITAL LIFE OF RUSSIAN REGIONS 2020

WHAT DEFINES THE DIGITAL DIVIDE?





Ruben VARDANYAN,
 Impact Investor and
 Venture Philanthropist

«The world has never been as dynamic as it is today: technological disruptions, demographic shifts, economic turbulence, and political unrest bring challenges on an unprecedented scale. Twenty years ago nobody could have imagined that the combined GDP of the top seven emerging markets could exceed that of the G7 countries. These markets offer both a great opportunity and a major challenge for any business. By establishing IEMS we wanted to contribute our views and insights to the dialog of business with policy-makers and NGOs in all emerging markets. We believe that open multi-stakeholder dialog will eventually help businesses and politicians come up with better-informed decisions that make a positive impact and drive change for better.»



Karl JOHANSSON,
 former Managing Partner,
 EY Russia & CIS,
 Chairman of the Analytical
 Credit Agency of Russia (ACRA)

«Studying emerging markets from within - that is the idea behind bringing together the research teams in Moscow, Hong Kong, and Hyderabad into the international and interdisciplinary research network. These are the most effective means to deal with the dynamics and complexity of the changing nature of emerging markets. Assisting international businesses better understand emerging markets and operating businesses in emerging markets expand globally - those are the strategic aims of the research initiatives at IEMS.»

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Dear friends,

Digitalisation of all areas of life is becoming an increasingly vital requirement in the modern age. It is an imperative for any country that wishes to solidify its position in our ever-changing world. It is no coincidence that the Digital Economy has become one of the key national programmes intended to shape the future of Russia. It is safe to say that the digital transformation of the economy is not just a fad or a way to spend more budget money but a key tool for improving the quality of life that should focus on the needs of the general public.

But is it possible to achieve nation-wide digital transformation without digitalisation at the regional level? The obvious answer is no, since a country's economy can only be as digital as its constituent parts. It is critical to understand the regions' relative progress with the digitalisation of economic and social life in order to properly assess the current situation across Russia and make realistic plans for the future.

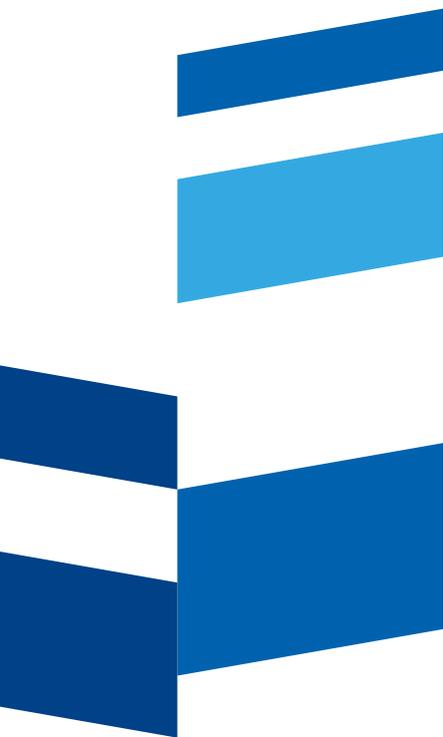
The Moscow School of Management SKOLKOVO has been studying regional digital development for over five years now, noting both a general positive trend and the areas requiring accelerated development. The goal of

this report is not so much to rank the country's regions in terms of their digital maturity as to provide scientifically-grounded suggestions for the direction and nature of actions to be undertaken by regional administrations, businesses and opinion leaders in order to accelerate digital transformation.

The results of this study encourage optimism—they show that the quality of a region's digitalisation is determined not by its resource capability but by the quality of the regional policies and human capital. The digital era can open up new opportunities for small and medium-sized cities, provided they set clear priorities and make efficient use of available resources, no matter how limited. This report does not just acknowledge the current situation but also shows how to design an effective digital acceleration programme that could create new social and economic opportunities and what relevant competencies should be developed by regional administrations, entrepreneurs and opinion leaders..

Andrei Sharonov

President of the Moscow School
of Management SKOLKOVO





Dear colleagues,

The issue of digital inequality grows increasingly relevant as economic success in the contemporary world is becoming more and more dependent on the use of modern digital technologies. For more than two decades, it has been attracting the interest of researchers and politicians, but we believe that business leaders should devote their full attention to it as well. There are two aspects of digital inequality and the digital divide that both global and local businesses need to consider—that of the market and of resources.

On the one hand, the local market's saturation with digital technologies leads to an increase the scale and variety of opportunities for businesses. On the other hand, since the development of digital technologies is closely related to the quality of human capital and the business environment, regions with advanced

digitalisation become attractive platforms for developing local management hubs, research and innovation centres, venture projects, etc. This new study by the Moscow School of Management SKOLKOVO describing the digital life of Russian regions provides ample food for thought for entrepreneurs looking for ways to expand their presence in the Russian market. Its conclusion is of particular interest as it debunks a popular belief that state-of-the-art technological development can only be achieved in the capital regions of Russia. The numbers presented in the study prove that businesses should start paying closer attention to small and medium-sized cities with considerable potential for development.

Alexander Ivlev

CIS Managing Partner at EY

Summary



Now that digital technologies have become a key driver of social and economic development of companies, regions and countries, the problem of the so-called digital divide, or the gap between the levels of technological capabilities, is growing increasingly acute. This divide can be observed within each country, and between regions or social and demographic groups. Some degree of digital divide objectively exists at all times, but beyond a certain level it becomes socially and politically unacceptable—when people from information-deprived regions or social groups find themselves in “another universe” in terms of their economic and social opportunities. It is critical to answer two questions: does the degree of digital divide increase or decrease over time in “natural” conditions, and are there scenarios for independent bridging of the digital divide by underperformers?

The majority of the world has moved beyond the “primary” digitalisation—creating the necessary Internet access infrastructure—to the “secondary” stage, i.e. creating as many individual digital solutions as possible that unite into comprehensive multidimensional systems. Such systems generate a network effect where the value to users grows faster than the number of system participants. To evaluate the processes of secondary digitalisation, the Moscow School of Management SKOLKOVO developed a seven-dimensional model of “digital life” back in 2014, and then proceeded to test it on Russian million-plus cities. In the new wave of the study, the sample included all the capitals of the constituent entities of the Russian Federation, as well as a number of major non-capital regional centres—91 cities in total. The expanded analysis scope made it possible to compare cities that differ greatly in terms of their size, income level, economic structure, and history.

The second-tier digital divide between Russian regions is considerable: the final Digital Life Index score of the leading cities (Krasnodar and Ekaterinburg) is almost 5 times higher than that of the trailing city (Magas-Nazran). At the same time, supply is distributed much more evenly, with only a three times difference between the leading and the trailing city; the resulting digital divide has more to do with gaps in digital demand determined by the population’s digital skills.

The correlation between the city’s size and the vibrancy of its digital life is not linear: small cities (with less than 100,000 people) have a higher scores than cities with a population of 100–200,000. In terms of demand, they even surpass cities in the 500,000 to 1 million people range, being second only to the million-plus cities. At the federal district level, the Ural Federal District and the Central Federal District take the lead. Despite Krasnodar’s leadership among cities, the Southern District is in the middle of the list, while the North Caucasian District is at the bottom.

Statistical analysis of the contributory factors revealed a picture similar to the well-researched digital divide between countries: human capital and expansionary policies play the key role, while the resource capability factor is not so significant. The results inspire a certain amount of optimism, since the digital divide can be bridged through purposeful strategic actions rather than by pouring resources into the regions. Each region can and should aim to develop its digital life to the fullest to experience significant results, such as:

- Acceleration of social and economic development and improvement of the quality of economic growth (fixing the existing structural imbalances in the well-resourced primary producing regions);
- Fair access to social and economic resources, reduction of inequality, and provision of inclusive opportunities;
- Decent quality of life with opportunities for self-fulfilment;
- Development of the region's soft power and competitiveness both on the national and the global scale.

What are the benefits of a well-developed digital life for a region? What can be gained from secondary digitalisation? A previous study by the Moscow School of Management SKOLKOVO demonstrated that digital technologies matter a lot when it comes to the general perceived quality of urban environment. They are turning into key competitive tools for cities and regions in the national and global human capital markets, helping them to attract, develop and retain successful, ambitious and innovative people who can give a fresh impetus to the regional social and economic development. Thus, bridging digital divide must be an integral part of any answer to the challenges faced by all Russian regions.



Digital Divide as the Key Challenge of the Digital Age.



Penetration by digital technologies into all aspects of daily life is becoming an increasingly important factor in the social and economic development of countries and regions. While creating new opportunities for growth acceleration, this integration also exposes risks of the so-called digital divide—countries and regions without sufficient resources for effective digitalisation increasingly lagging behind the leaders. The digital divide between countries is becoming a progressively more urgent global problem,ⁱ but it can also be observed within countries, between regions or social and demographic groups.

In 1998, the U.S. National Telecommunications and Information Administration pointed out that the gap between some social groups in terms of Internet access could be as large as twentyfold.ⁱ The increasing importance of the Internet as a means of obtaining information, as an economic tool and as a socialisation facility meant that, with the status quo preserved, society faced a real danger of division into the “information rich” and the “information poor”. Subsequent studies on the differences in Internet access levels between different countries revealed an even more troubling picture: in 2000, the disparity between OECD and non-OECD countries was almost a hundredfold, and within the OECD itself, the gap between the leader, the U.S., and Mexico and Turkey was almost as great.

For some time, the digital divide seemed like an inevitable side effect of the early stages of the brave new wired world. The explosive growth of the global Internet, with numerous access channels (particularly various mobile technologies), provided an illusory solution to the problem, with the convergence of

countries, regions and social groups in terms of “information wealth”. However, a number of recent studies in the U.S. have shown that the county-level digital divide is still almost hundredfold.ⁱⁱ

Some degree of digital divide must exist in all numerate societies, but beyond a certain level it becomes socially and politically unacceptable. It is difficult to pinpoint where this critical threshold lies, but it is intuitively clear that situations in which people from information-deprived regions or social groups can find themselves in “another universe” in terms of their economic and social opportunities should not be tolerated. For regions, this can accelerate human capital outflow and make it irreversible. The Moscow School of Management SKOLKOVO’s 2016 study *Digital Life of Russian Megapolises* has shown that the quality of the digital environment in a city correlates closely with the perceived quality of life, i.e. access to digital information is becoming a key factor in general well-being. With a wide digital life development gap, a city risks losing its most innovative, dynamic and mobile residents—those who can develop its digital environment effectively. Such trends can become a vicious circle, where greater human capital losses mean fewer opportunities to attract, develop and retain such capital.

In this context, it is critical to answer two questions: (1) does the degree of digital divide increase or decrease over time in “natural” conditions (i.e. without significant efforts to accelerate the development of underperforming countries and regions), and (2) are there scenarios in which independent bridging of the digital divide by underperformers can

¹ This problem started gaining attention at the turn of the century, prompted by the publication of such influential books as *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide* (Pippa Norris, 2001) and *Technology and Social Inclusion: Rethinking the Digital Divide* (Mark Warschauer, 2004). The more recent important publications on this topic include the chapter *The Digital Reproduction of Inequality* in (Eszter Hargittai, 2018)

happen, or does that require a considerable amount of external resources? The answers to these questions can define the processes of national digital strategising that is gaining momentum throughout the world.ⁱⁱⁱ

By definition, such answers require quantitative study, but that presents serious methodological challenges. In general, it seems evident enough that digital transformation processes should be evaluated on the basis of their outputs rather than inputs—otherwise, the less well-off countries and regions would indeed be destined forever to lag behind to an ever-increasing extent. However, even simply identifying the number of outputs subject to evaluation can, and does, cause heated debate. In general, researchers agree that the first-tier digital divide (inequality in terms of access to digital networks) decreases while the second-tier digital divide (inequality in terms of digital competencies and ways to use technologies) increases. This poses the threat of a catastrophically increasing third-tier divide in terms of the social and economic effects of a digital transformation, which can lead to a vicious circle where “the rich get richer and the poor get poorer”.

The majority of the world has already moved beyond “primary” digitalisation—creating the necessary Internet access infrastructure—to the “secondary” stage, i.e. creating as many individual digital solutions as possible that unite into comprehensive multidimensional systems. Such systems generate a network effect where the value to the user grows faster than the number of system participants. To evaluate the processes of secondary digitalisation, the Moscow School of Management SKOLKOVO developed a model of “digital life” in 2014 that included seven dimensions: transportation, finance, retail,

healthcare, education, media, and state administration.^{iv} Supply and demand are evaluated for each aspect individually, and analysis of gaps between them provides concrete ideas for managerial actions (See the insert *How to Measure a City’s Digital Life?*). This model was tested on Russian million-plus cities as part of the two studies (2014 and 2015), which generated interesting comparison data, both static and dynamic.

In the second wave of the study, the sample was greatly expanded to include all the capitals of the constituent entities of the Russian Federation, as well as a number of major non-capital regional centres²—91 cities in total. The expanded analysis scope made it possible to compare cities that differ greatly in terms of their size, income level, economic structure, and history. The comparison data allowed researchers to analyse digitalisation across Russia, the results of which can be used as a basis for strategic decisions in both business and state administration.

2 Volzhsky, Naberezhnye Chelny, Nizhny Tagil, Novokuznetsk, Sochi, Surgut, Tolyatti, Cherepovets

How to Measure the Digital Divide?

The concept of the digital divide was formulated in the late 1990s and at first applied to the inequality of access to digital information channels between various social groups.^v Early studies focused on the “knowledge divide” and “information poverty” which had crystallised in the mid-1970s, in large part due to the influence of Thomas Childer’s book *The Information Poor in America*.^{vi} At first, researchers considered Internet access as just another channel for obtaining information, with no fundamental difference from other channels, which was the approach that the early critique of the digital divide concept was based on.^{vii}

In the early 2000s, researchers turned their attention to the topic of digital divide between countries and regions within a given country^{viii} and attempted some of the first quantitative comparisons based on the Internet availability data. That was when the key questions that have shaped subsequent research were first raised: “Will the gap in Internet access gradually decrease over time, as new technologies spread further throughout the world? Or will this gap remain, or even increase? How can government, corporate and non-profit investments [into access tools] ... expand access for groups that are limited in that regard?”^{ix}

The search for the answers to those questions is still relevant today, except that studies on the first-tier digital divide (in digital network access options) have given way to studies on the second-tier digital divide (in network utilisation skills and subsequent creation of various applications). The idea for this differentiation was suggested in 2006 by a group of researchers from the University of Ljubljana, Slovenia, who used the integrated Digital Divide Index to evaluate the depth of the second-tier digital divide.^x A similar index was later used to study the county-level digital divide in the U.S.^{xi}, but the potential for using integrated metrics to describe the effects of digitalisation and for studying the second-tier digital divide has clearly not been exhausted yet.

The modelling of factors that determine the depth of digital divide has become one of the key areas of digital divide studies, as such models can directly inform both national and regional strategies and policies. The first model of this sort was suggested in 2001^{xii} and included the following factors: income level, infrastructure, human capital,

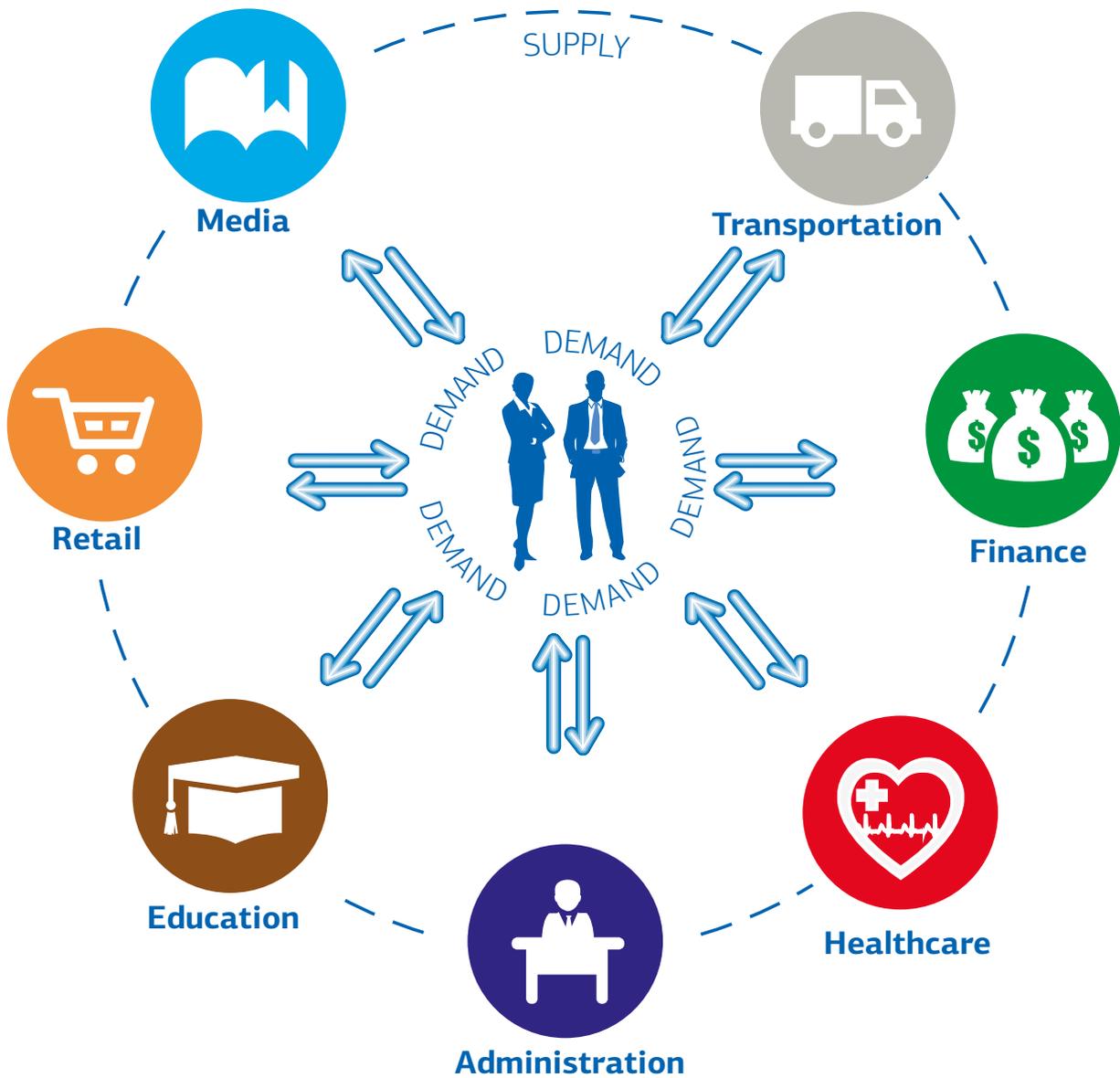
and regulation quality. A study of 53 countries showed that regulation quality—national telecommunications market policy and its level of competitiveness in particular—is a key digital divide factor, second only to the level of income.

The Income—Infrastructure—Human Capital—Policy model was generally accepted by researchers as fundamental, though sometimes with reservations.^{xiii} However, the importance of regulation quality was repeatedly confirmed.^{xiv} A number of authors studying the impact of cultural factors on the digital divide found out that cultural differences (measured based on, for instance, the Hofstede model) played a certain role at the early development stages of digital networks but had lost their significance by the late 2000s.^{xv}

In 2014, the Moscow School of Management SKOLKOVO developed a methodology for describing the second-tier digital divide between cities^{xvi} and for examining its determinant factors. This addressed a key methodological challenge—finding a proper way to describe secondary digitalisation, i.e. the use of digital systems in daily life. It applied the **Digital Life Index**³ to comparison of secondary digitalisation in 15 Russian cities with a population of over a million people as of 2014: Moscow, St. Petersburg, Kazan, Volgograd, Novosibirsk, Ekaterinburg, Nizhny Novgorod, Samara, Chelyabinsk, Omsk, Rostov-on-Don, Ufa, Krasnoyarsk, Perm, and Voronezh. Each city was evaluated on seven digital technology criteria: transportation, finance, retail, healthcare, education, media, and state administration. For each, specific metrics were selected that indicated the integration of digital services into the city's daily life. The evaluation used some existing metrics from other studies and new empirical data collected specifically for this research. All metrics were divided into two types: the first dealt with the demand for digital solutions, and the second with their supply. This approach made it possible to separate two fundamentally different issues of the digital divide: the lack of technological capability and its poor utilisation due to the undeveloped digital skills. In particular, the 2014 and 2015 studies showed little correlation between supply and demand, indicating that market factors played a minor role in the formation of regional digital ecosystems.

3 The Index methodology was developed under the guidance of Prof. Evgeny Kaganer (IESE Business School, Spain)

Daily Urban Life Model



How Large Is the Digital Divide?

The second-tier digital divide between Russian regions is considerable: the final Digital Life Index of the leading cities (Krasnodar and Ekaterinburg) is almost 5 times higher than that of the trailing city (Magas-Nazran as a single entity). The trajectory of the Index across regions makes it possible to identify three groups: leaders—the first 19 cities (with two “super leaders”, Krasnodar and Ekaterinburg, far ahead of the others), the average performers, and the laggards—a clearly identifiable group of 9 cities with its own “super laggard” (see Chart 1). The Index drops faster near the end of the distribution, which indicates

systemic digitalisation problems in the lagging group.

It should also be noted that digital supply and demand indices show significantly different dynamics. The supply is distributed more evenly, with the difference between the leading and the trailing cities reduced to three times. Therefore, it is the divide in digital demand that drives the overall digital divide, which is fully consistent with the idea of the second-tier divide being determined by the difference in the population’s digital skills and competencies.

Despite what intuition might suggest, the correlation between a city’s size and the vibrancy of its digital life is not fully

Fig. 1. Digital Life Index Overall Distribution

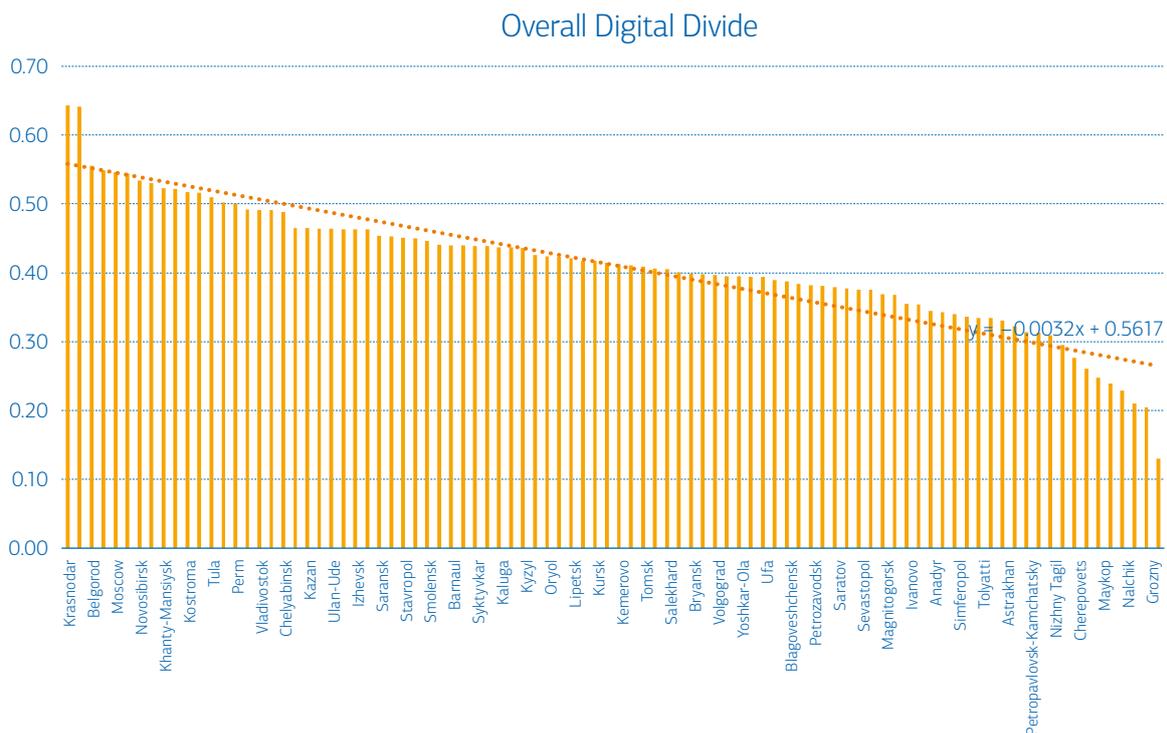


Fig 2. Digital Supply Index Distribution

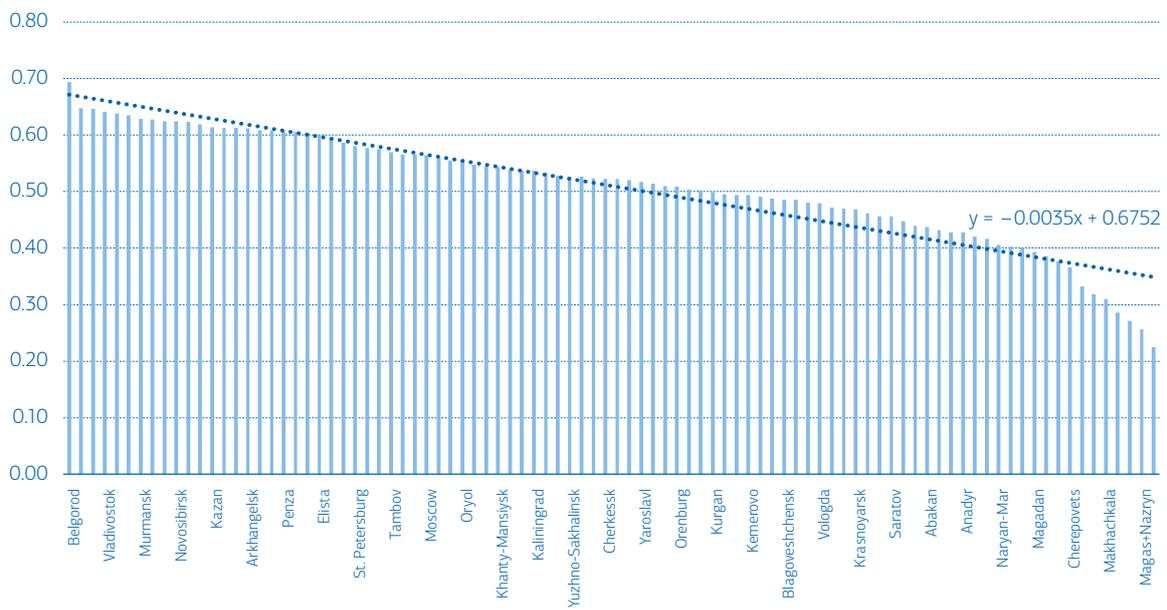
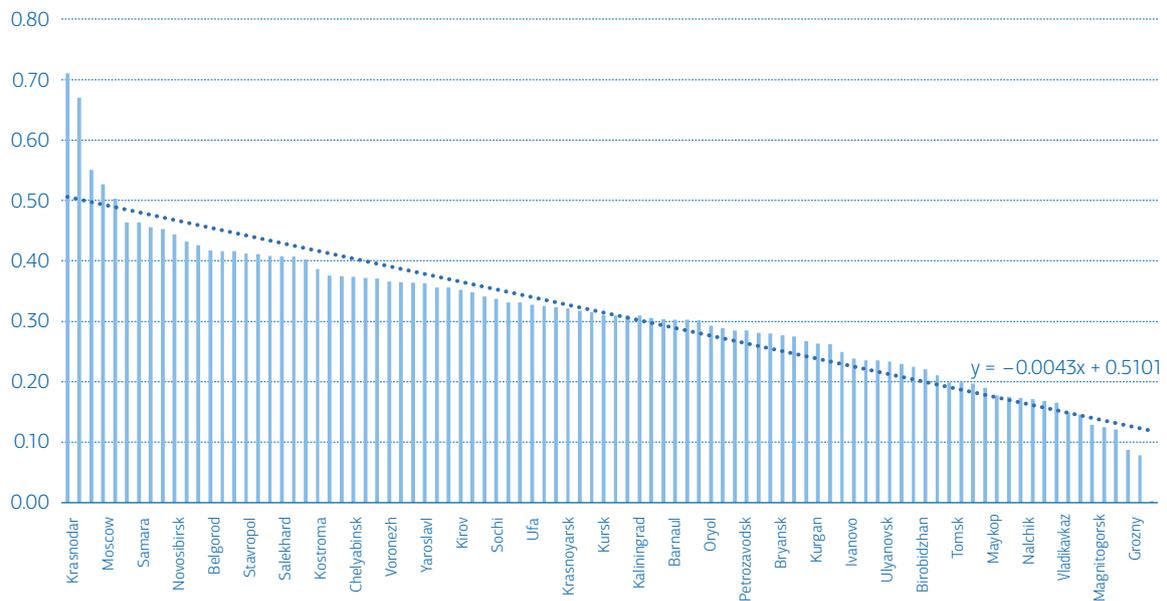


Fig 3. Digital Demand Index Distribution

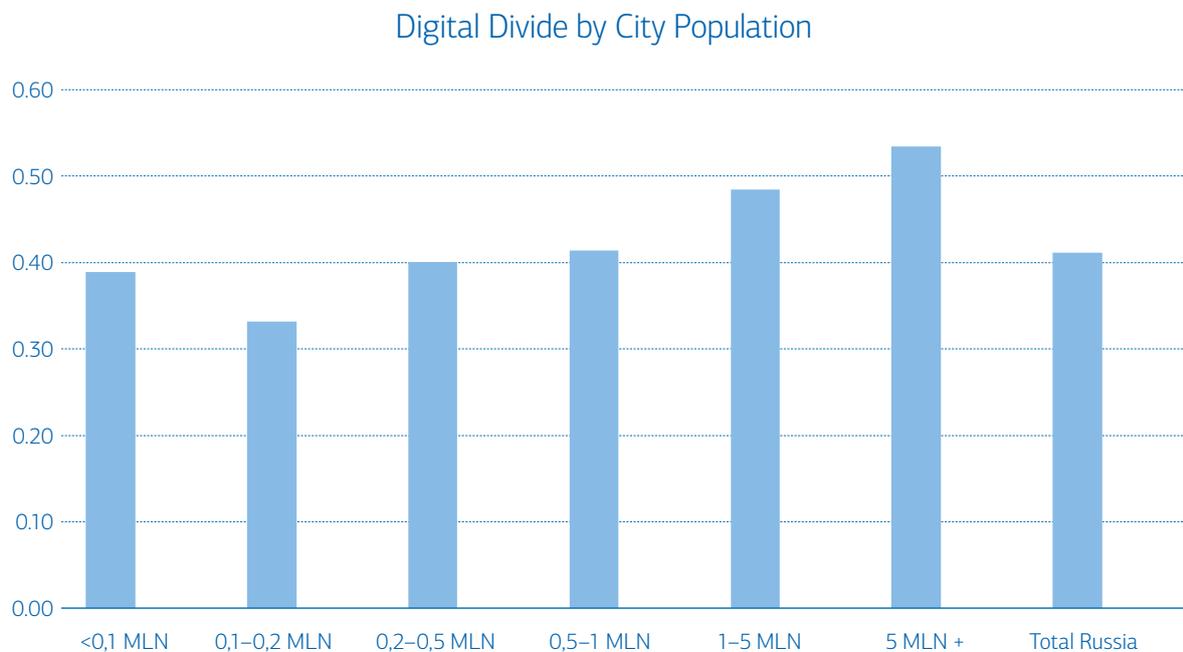


linear:⁴ the-smaller-the-city-the-weaker-the-digitalisation tendency does not apply to small cities (with less than 100,000 people) within the sample. They have a higher index than cities with a population of 100–200,000 (see Chart 4). This can be partially explained by the fact that smaller capital cities are often located in resource-producing regions with high GRP (Khanty-Mansiysk, Salekhard, Naryan-Mar, Anadyr, Magadan). However, even the relatively poor Gorno-Altaysk and Birobidzhan show reasonable results. It seems that compactness of the urban environment, including the community, tends to

accelerate digital technology penetration and demand. In terms of demand, smaller towns surpass even the cities in the 500,000 to 1 million people range, being second only to the million-plus cities. Having said that, digital demand does gradually decrease in proportion with city size, though two Russian megapolises (Moscow and St. Petersburg) fail to show any difference from other million-plus cities in this respect (see Chart 5).

At the federal district level, the Ural Federal District and the Central Federal District take the lead. Despite Krasnodar’s leadership among cities, the Southern District is only in

Fig. 4. Digital Life Index Distribution by City Size



⁴ It should be noted that most metrics within the Digital Life Index apply to city populations, which removes the scale effect needed to identify the intensity of digitalisation. This approach was used in the digital divide literature by Dasgupta et al.: Dasgupta, S., Lall, S., & Wheeler, D. (2001). Policy Reform, Economic Growth and the Digital Divide. The World Bank Development Research Group.

Fig. 5. Digital Supply and Demand Distribution by City Size

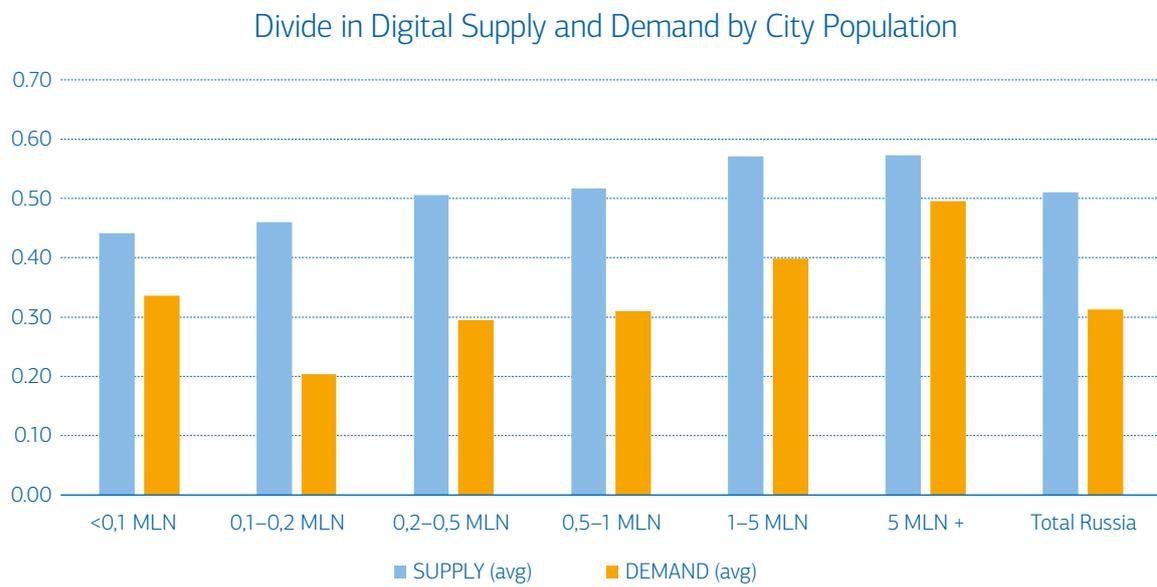


Fig. 6. Digital Life Index per Federal Districts

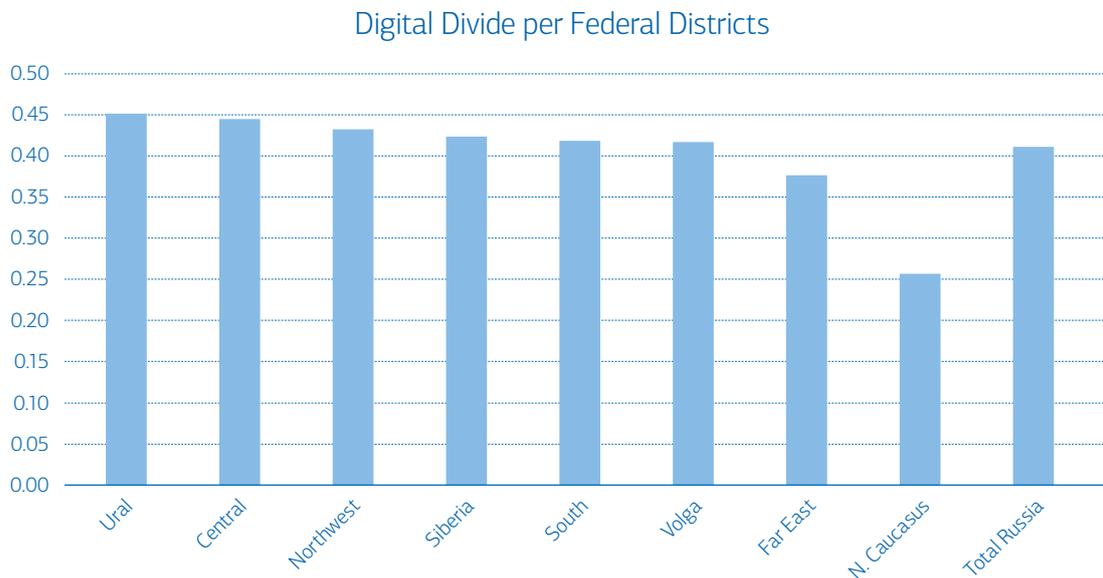


Table 1. Digital Life Index Comparison for Regional Centres and Second Cities

Regional centre	General index	Second city	General index
Volgograd	0.40	Volzhsky	0.31
Vologda	0.45	Cherepovets	0.28
Ekaterinburg	0.64	Nizhny Tagil	0.31
Kazan	0.46	Naberezhnye Chelny	0.26
Kemerovo	0.41	Novokuznetsk	0.40
Krasnodar	0.64	Sochi	0.49
Samara	0.55	Tolyatti	0.33
Khanty-Mansiysk	0.52	Surgut	0.41
Chelyabinsk	0.49	Magnitogorsk	0.37

Table 2. Digital Supply and Demand Comparison for Regional Centres and Second Cities

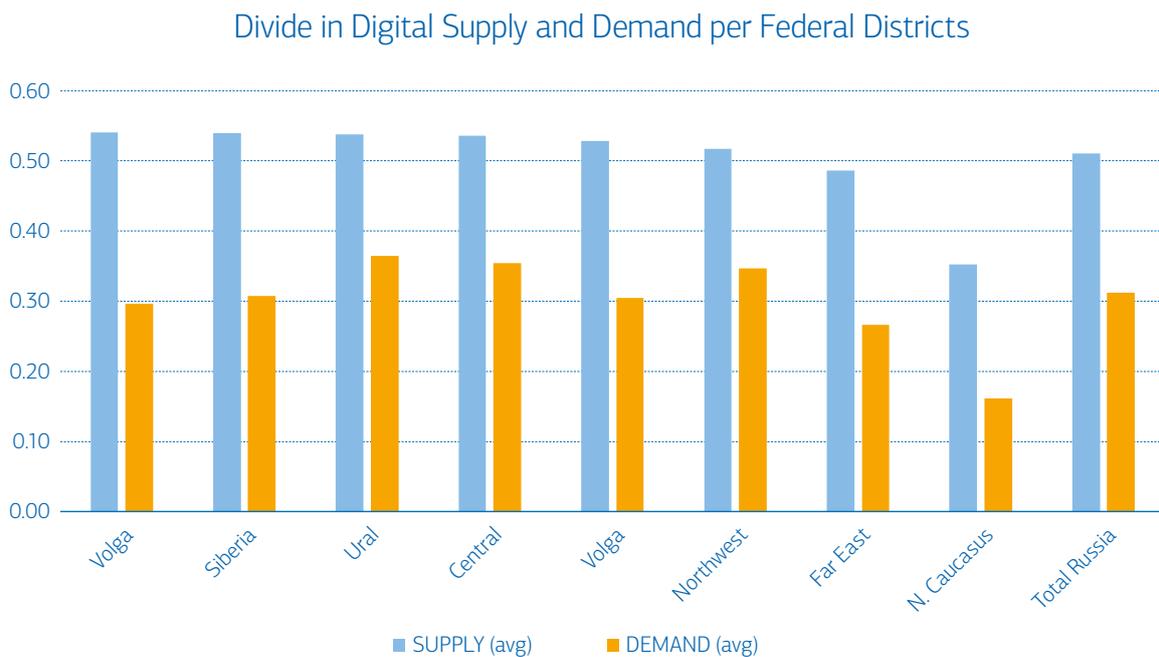
Regional centre	SUPPLY (avg)	DEMAND (avg)	Second city	SUPPLY (avg)	DEMAND (avg)
Volgograd	0.54	0.25	Volzhsky	0.54	0.09
Vologda	0.48	0.43	Cherepovets	0.37	0.17
Ekaterinburg	0.61	0.67	Nizhny Tagil	0.42	0.20
Kazan	0.61	0.32	Naberezhnye Chelny	0.40	0.12
Kemerovo	0.49	0.33	Novokuznetsk	0.57	0.24
Krasnodar	0.58	0.71	Sochi	0.65	0.34
Samara	0.63	0.46	Tolyatti	0.51	0.13
Khanty-Mansiysk	0.54	0.50	Surgut	0.53	0.29
Chelyabinsk	0.60	0.37	Magnitogorsk	0.61	0.12

the middle of the list,⁵ while the North Caucasian District is far behind, at the very bottom (see Fig. 6). Interestingly, the situation changes when analysing supply and demand separately: the Southern District—along with the Siberian and Ural Districts—takes the lead in terms of supply, while the Ural, Central and Northwestern Districts lead in terms of demand. As in the case of distribution by city size, the difference in demand is significantly more pronounced than the difference in supply.

Another important aspect of digital divide is the difference in digital life maturity between capitals of the Russian Federation’s constituent entities and other cities in

a given region. In some cases, it is the “second” cities that function as major industrial centres, sometimes surpassing the “first” cities in terms of population: Cherepovets and Vologda, Surgut and Khanty-Mansiysk, Novokuznetsk and Kemerovo. However, in almost every case the second cities have a significantly lower digital life index. The only exception, where the values are almost equal, is the pair Kemerovo-Novokuznetsk (see Table 1). The difference is largely determined by demand: in terms of supply, some of the second cities even surpass their regional centres (Novokuznetsk, Sochi, Magnitogorsk), but all pairs are far from equal in terms of digital demand.

Fig. 7. Digital Supply and Demand per Federal Districts



⁵ A similar pattern was observed in the 2014 and 2015 studies where Volgograd and Rostov-on-Don were among the lagging million-plus cities.

Components of Digital Life



The analysis of individual dimensions of digital life suggests two important observations: very large gaps in demand; and a lack of correlation between supply and demand for most dimensions.

As Table 3 shows, the difference in digital demand between the leading and the lagging city can be 160-fold! There are only two dimensions of digital life—education and administration—where the divide is relatively small. Interestingly, both dimensions function primarily as domains of government agencies. However, in two other dimensions with significant state participation—transportation and healthcare—the gap in digital demand between regions is considerably higher. The media sphere, which is under strong administrative influence in many regions, shows the largest divide.

That being said, the gaps in digital supply are significantly smaller, and in some cases

very small. They are twofold in healthcare (probably as a result of the national project implementation), and fourfold in transportation and administration. The largest divide in supply is in the media.

Only three out of seven dimensions show noticeable positive correlation between supply and demand: transportation, retail, and administration. The area of digital administration demonstrates considerable progress compared to the results of the 2014 and 2015 studies, when the correlation was almost zero. On the one hand, that can be explained by the population’s growing competencies in using electronic platforms of regional administrations and, on the other hand, by the improved quality of these platforms, especially when it comes to user experience.

However, such dimensions as education and media show almost zero correlation, i.e.

Table 3. Difference Between Leading and Lagging Cities, and Supply and Demand Ratios for Digital Life Dimensions

	Supply, difference between leader and laggard, times	Demand, difference between leader and laggard, times	Correlation
Transportation	4.00	129.59	0.36
Finance	8.04	90.95	-0.36
Retail	10.36	144.95	0.37
Healthcare	2.00	58.98	-0.10
Education	9.50	15.94	-0.01
Media	47.77	159.15	-0.01
Administration	4.00	15.54	0.29

Table 4. Supply Correlations for Digital Life Dimensions. Significant Correlations Singled Out

	Transportation	Finance	Retail	Healthcare	Education	Media	Administration
Transportation		0.02	0.05	-0.24	0.08	-0.01	0.23
Finance	0.02	1.00	0.32	-0.01	0.07	0.08	0.12
Retail	0.05	0.32	1.00	-0.28	0.15	0.27	-0.06
Healthcare	-0.24	0.07	0.15	0.10	1.00	-0.05	0.01
Education	0.08	-0.01	-0.28	1.00	0.10	-0.29	-0.07
Media	-0.01	0.08	0.27	-0.29	-0.05	1.00	0.24
Administration	0.23	0.12	-0.06	-0.07	0.01	0.24	1.00

Table 5. Demand Correlations for Digital Life Dimensions. Significant Correlations Singled Out

	Transportation	Finance	Retail	Healthcare	Education	Media	Administration
Transportation	1.00	0.21	0.54	0.62	0.30	0.40	-0.13
Finance	0.21	1.00	0.27	0.22	0.19	0.40	-0.09
Retail	0.54	0.27	1.00	0.65	0.49	0.40	0.04
Healthcare	0.62	0.22	0.65	1.00	0.41	0.56	-0.11
Education	0.30	0.19	0.49	0.41	1.00	0.30	0.27
Media	0.40	0.40	0.40	0.56	0.30	1.00	-0.18
Administration	-0.13	-0.09	0.04	-0.11	0.27	-0.18	1.00

supply and demand are not interlinked in any way. There is a weak negative correlation in healthcare, i.e. demand is significantly higher than supply, and a strong negative correlation in finance where there seems to be a very large reserve of digital technology with low demand.⁶

Characteristically, digital demand shows little coordination between various dimensions. There are only a few cases with significant correlations, including transportation and administration, media and administration, and finance and retail. In some cases, there are counter-intuitive negative correlations⁷ (e.g., transportation and healthcare, or education and media). However, those could be random fluctuations. For most dimensions, correlations are close to zero, which means that creation of various digital platforms (which

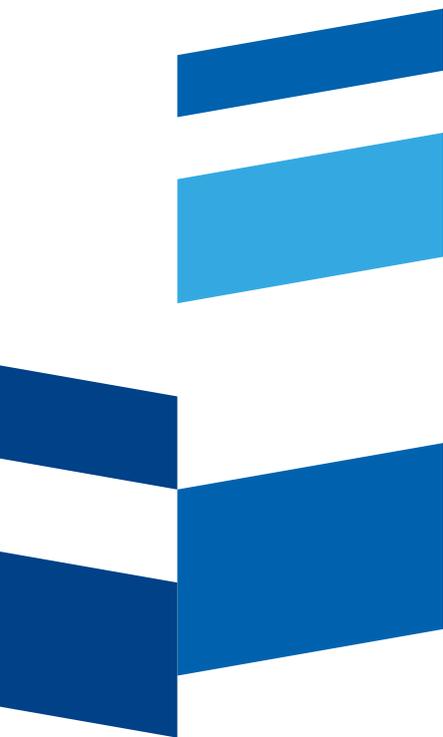
basically determine supply) follows completely independent parallel paths (see Table 4).

When it comes to digital demand, we see a reverse situation, with significant positive correlations between almost all dimensions: transportation and retail (0.54), transportation and healthcare (0.62), retail and healthcare (0.65), healthcare and media (0.56). It is unlikely that the identified pairs are directly related; high correlations probably indicate that digital demand is systemic in nature, and the growth of skills and competencies in using one type of system can be easily translated to other systems. The only exception is the administration dimension that has only one significant positive correlation, with education, with no other correlations between demand for digital regional government and demand for other digital life dimensions (see Table 5).

⁶ Diagrams showing leading and lagging cities in terms of the supply and demand ratio for each dimension are provided in Appendix 2

⁷ That is, the more developed one dimension is, the weaker the other is

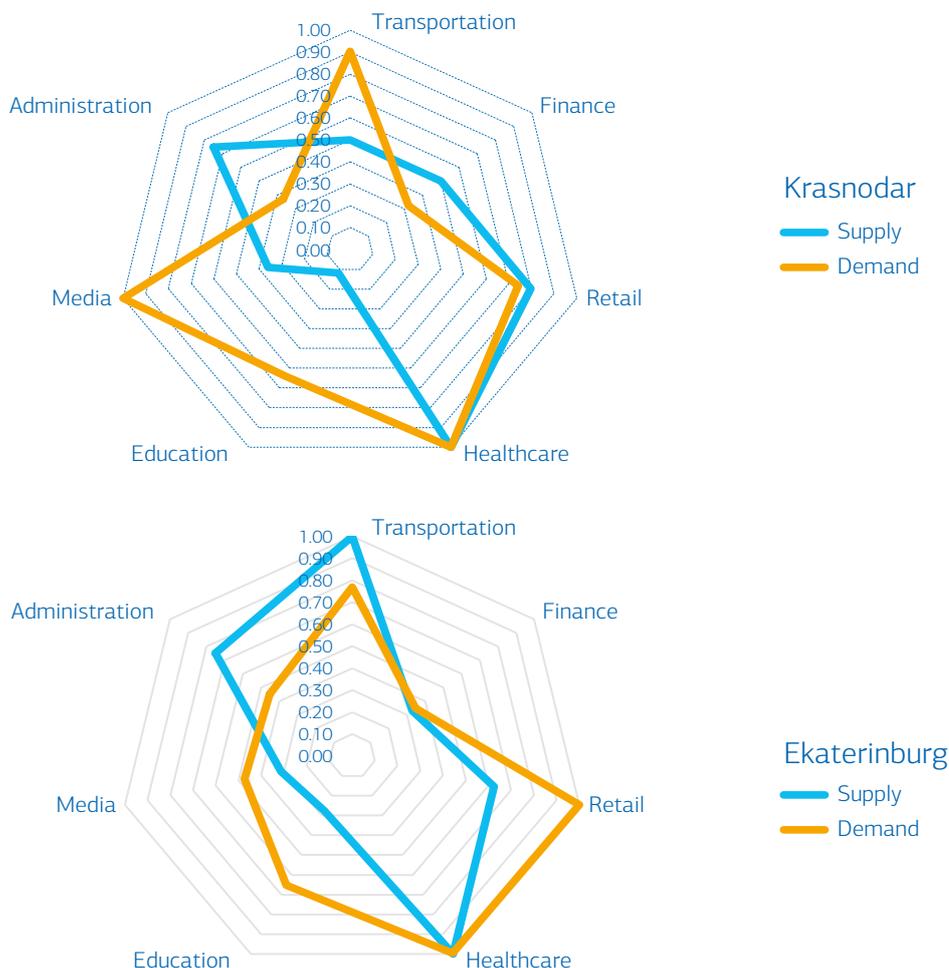
Leading Cities in Terms of Digital Life



The level of digital life maturity varies significantly even between leading cities not so much quantitatively as qualitatively. In most cases, a city has a clear “profile” both in terms of demand and supply, with only a handful of cities showing strong correlation between them. Below are the digital profiles of cities that lead in four population-based categories: over 1 million people, 500,000 to 1 million people, 100,000 to 500,000 people, and less than 100,000 people.

Population of Over 1 Million People

This category, as well as the overall ranking, is topped by Krasnodar and Ekaterinburg with equal index values but noticeable differences when it comes to their digital profiles. Krasnodar shows high demand in transportation, media, healthcare and retail, and high supply in healthcare, retail and administration. Ekaterinburg shows high demand in retail, transportation and healthcare, and high supply in transportation, healthcare, retail and administration.



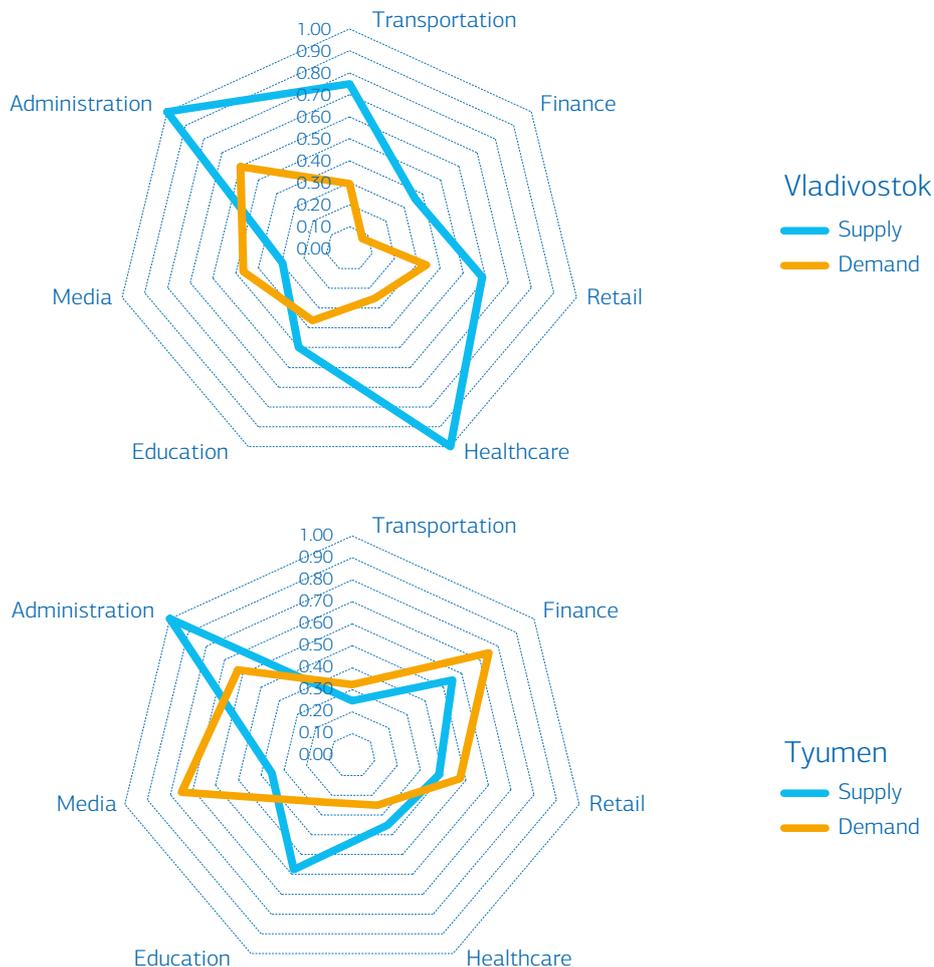
Population of 500,000 to 1 Million People

The leaders in this category are Vladivostok and Tyumen. Both are not so high in the overall ranking, sharing the 17th and the 18th position (and yielding to many of the smaller cities). This example clearly shows how different some cities' digital profiles can be despite similarities in digital life maturity.

Vladivostok has an average demand that is more or less evenly distributed between

all digital life dimensions, save for a dip in finance. The supply is strong in healthcare, administration and transportation, and weak in media and finance.

Tyumen has a more developed overall demand, especially strong in the areas of finance, media and administration. The supply is strong in administration, less so in finance and education, and weak in transportation and media.

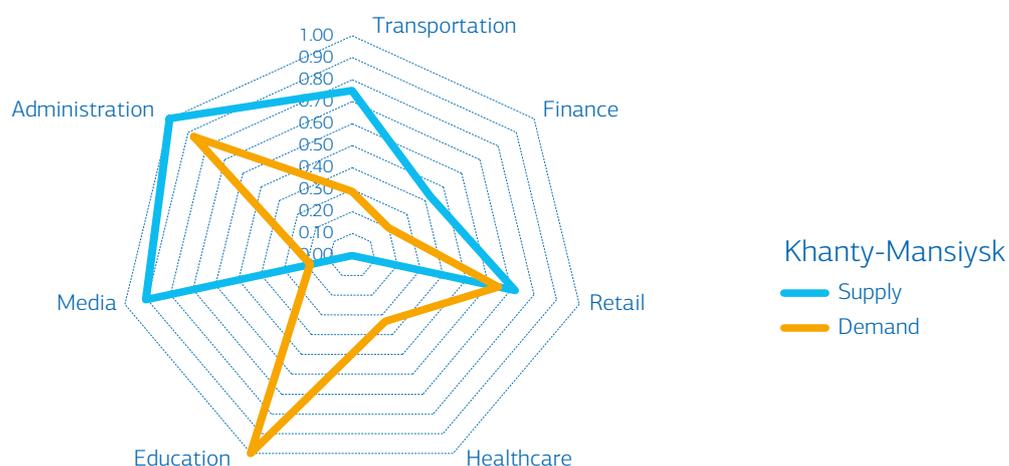
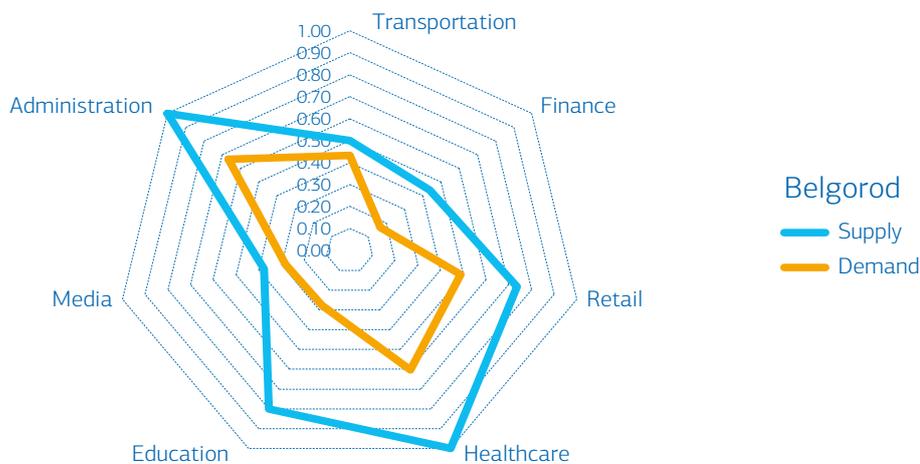


Population of 100,000 to 500,000 People

Belgorod, in 3rd position in the overall ranking (higher than both capitals), is a rare example of a balanced supply-and-demand situation (which is clearly demonstrated in the chart). Both supply and demand are well-developed in administration, healthcare and retail, with high demand also observed in education. The supply takes a rather large dip in finance.

Population of Less Than 100,000 People

This group is topped by the resource-rich Khanty-Mansiysk, which is in 9th position in the overall ranking. It is characterised by a very uneven digital development with high supply in administration, media, transportation and retail, and very weak supply in healthcare and education. The supply is strong in administration, education and retail, and weak in finance, media and healthcare.



Digital Divide Determinants



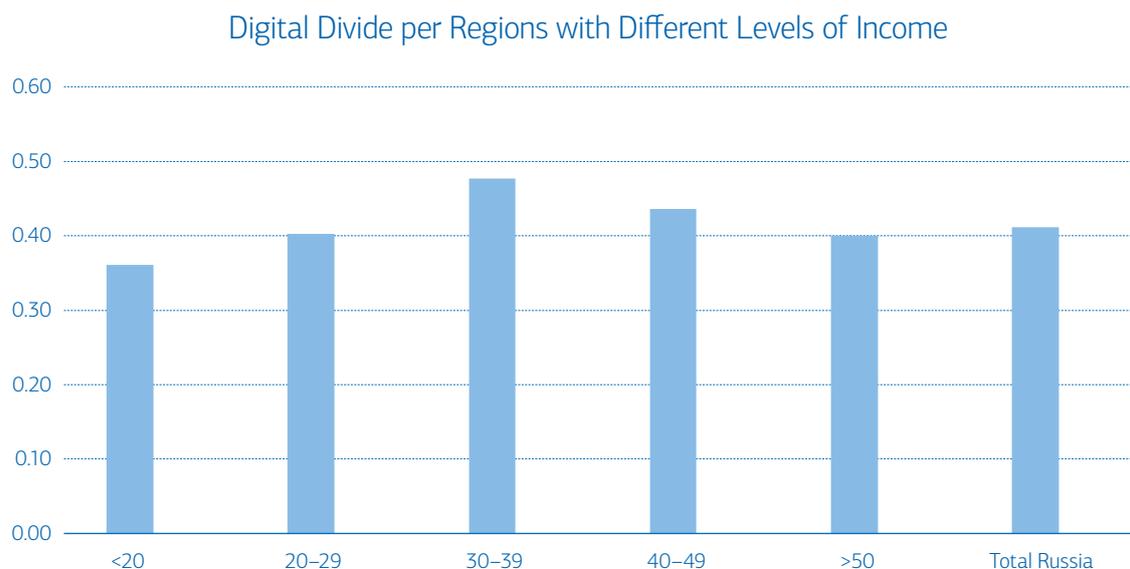
A key question regarding the digital divide is whether it is possible to bridge it. To answer this question, it is necessary to identify the determinant factors. The first models attempting to explain the first-tier digital divide appeared in 2001.⁸ The researchers tried to establish the extent to which it was determined by the level of wealth—in the form of GDP per capita. If it had turned out to be the key factor, the only viable bridging strategy would have been a general economic catch-up, which is inevitably a slow process.⁹

This question is just as relevant for Russian regions as it is in the international context: the gap in the gross regional product per capita between the richest and the poorest

regions is more than tenfold. The analysis of digitalisation distribution per Russian region according to their level of income shows no linear correlation. The overall index value is the highest for cities with average income. When it comes to “rich” cities with average monthly incomes of over RUB 50,000 per person, the index value is the same as for the cities with income of RUB 20,000 to RUB 29,000, while their digital demand development is the weakest among all groups (see Figs. 8 and 9).

If the level of economic resources is not the primary determinant, what is it for the development of secondary digitalisation in a region? To answer this question, a regression analysis was performed based on the model

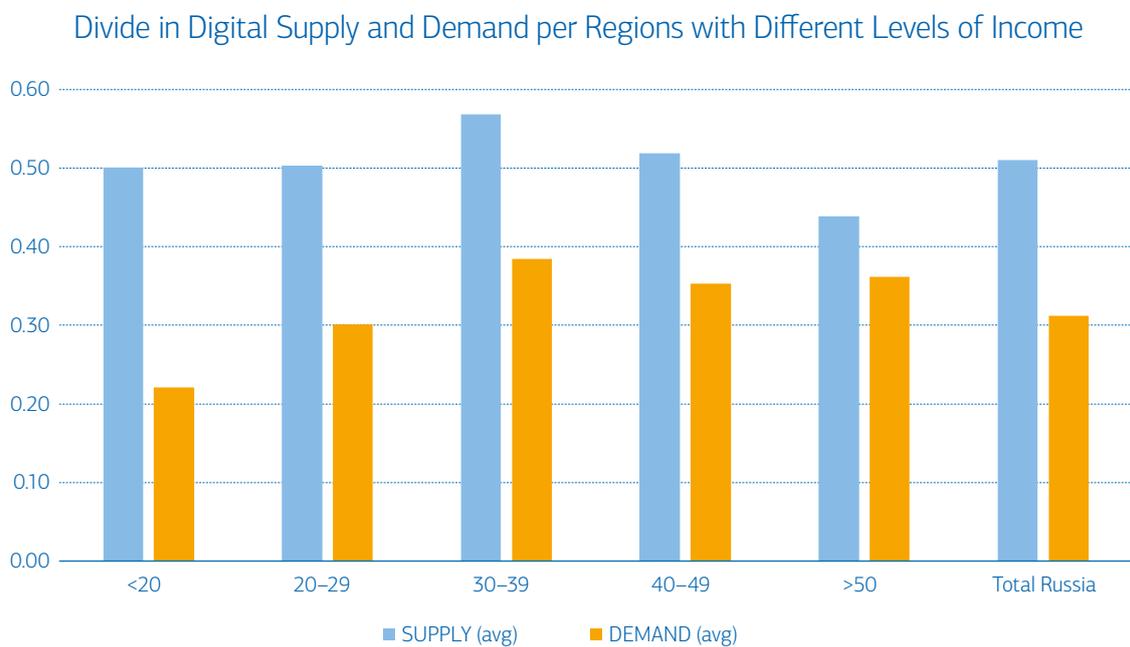
Fig. 8. Overall Digital Life Index According to a City’s Average Monthly Income (RUB Thousand)



⁸ See section Brief History of Digital Divide Studies below

⁹ Some of the early critics of the digital divide concept like Mark Warschauer thought that it posed the wrong question: according to their thinking, the digital divide was just an isolated case of a general social and economic divide that could not be bridged separately (Warschauer, M. (2002). Reconceptualizing the Digital Divide. *First Monday*, 7(7)).

Fig. 9. Digital Supply and Demand According to a City's Average Monthly Income (RUB Thousand)



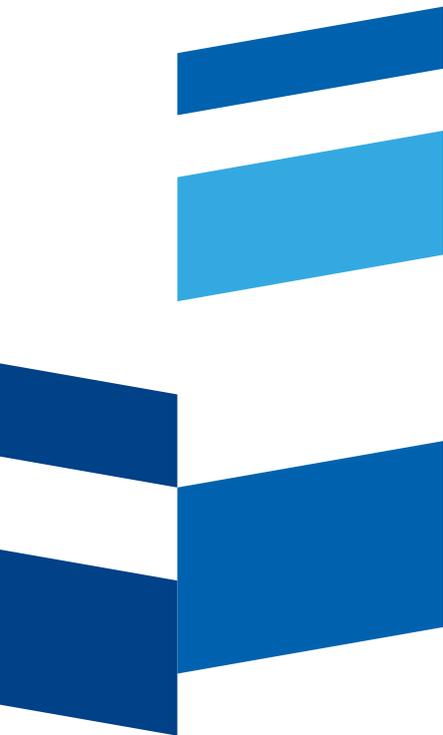
suggested in 2001 by Dasgupta et al. (see section How to Measure the Digital Life? for more details) with three groups of determinants: income, human capital, and expansionary policies.

This analysis showed that, in general, the digital divide between Russian regions was determined by the same factors as the well-researched digital divide between countries: the

key role was played by human capital and expansionary policies. That being said, the role of human capital for Russia is much more significant, especially when it comes to demand. That makes sense, since policies applied within the same country are as a rule more homogeneous in nature. As should be expected, the policy factor plays a much bigger role in terms of supply.



How to Bridge the Digital Divide?



The results inspire a certain amount of optimism, since it appears that the digital divide can be bridged through purposeful strategic actions rather than by pouring in resources. Each region can and should aim to develop its digital life to the fullest to experience significant results. These should include:

- Acceleration of social and economic development and improvement of the quality of economic growth (correcting existing structural imbalances in the well-resourced primary producing regions);
- Fair access to social and economic resources, reduction of inequality, and provision of inclusive opportunities;
- Decent quality of life with opportunities for self-fulfilment;
- Development of the region's soft power and competitiveness both on the national and a global scale.

This study by the Moscow School of Management SKOLKOVO and others published in international research journals make it possible to define key areas of a potential action plan for the administration, business leaders and opinion leaders in each region. These are:

1. Development of digital demand and creation of skills and competencies for effective use of digital platforms and systems. As noted earlier, it is the difference in the levels of demand that determines much of the digital divide between regions.
2. To develop digital competencies, it is necessary to increase a region's human capital quality and to cultivate a creative environment that facilitates innovation. The statistical analysis shows that human capital components are the

most significant determinants of digital life quality in a given region.

3. It is also vital not to lose sight of the digital supply creation agenda. However, rather than one-off super projects, the most effective measure in this regard would be a large number of experiments offering various business models to consumers. As foreign studies show,^{xvii} one of the most important determinants of the digitalisation quality is the market's competitiveness, as well as the competitiveness of products offered on the market. In this respect, regional administrations and leading regional enterprises from "traditional" industries must become competent customers of digital systems and create opportunities for the development of products with the potential to enter national and global markets, rather than just addressing individual local problems.

As clear as this programme architecture is, it is difficult to implement, since it does not entail direct administrative actions bringing immediate results. This is what makes the secondary digitalisation stage different from earlier stages that required investment in infrastructure to provide access to the Internet and, as such, brought quick and easily measured results. The current tasks faced by regional politicians aiming to bridge the digital divide are much harder: they have to provide fertile ground for numerous individual actors to create successful projects on the side of supply, while stimulating the growth of demand for these projects. Areas of action for regional project administrations might include creating effective open digital technology

¹⁰ Unfortunately, a quantitative assessment of this aspect as related to Russian regions was not possible due to the absence of relevant data

¹¹ In many respects, this is what complicates the implementation of the Digital Economy National Project (it was in last place among all national projects in 2019 in terms of budget performance) https://www.cnews.ru/news/top/2020-01-13_tsifrovaya_ekonomika_provalila

platforms in the region, switching the regional administration into “digital government” mode, creating a regulatory environment to support the digital transformation of business and digital entrepreneurship, or developing and implementing educational initiatives to facilitate the transition to a digital economy.

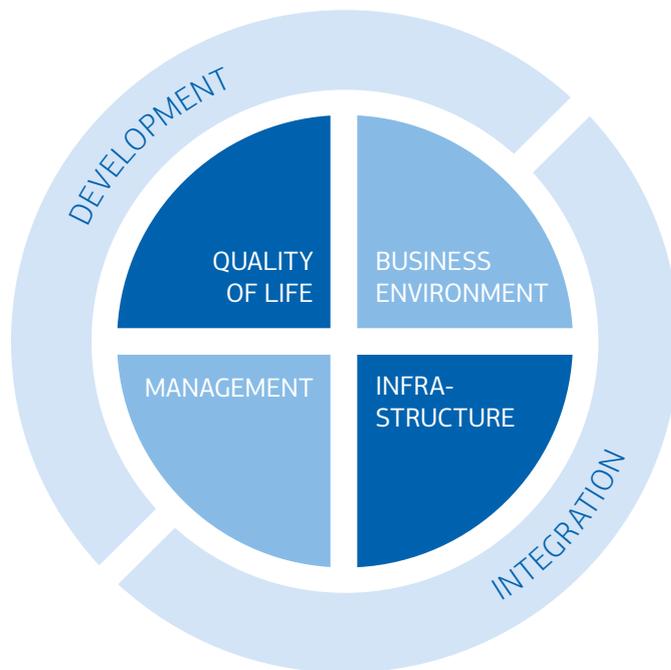
It should all lead to an accelerated development of the region in four areas: quality of life, business environment (ease and efficiency of doing business), quality of management, and infrastructure (including increased benefits from traditional types of infrastructure assets). If these are sustained over the

long-term they will ensure integration of the regional social and economic ecosystem at the national and global levels (see Fig. 9).

To achieve that, regional elites (including administration, businesspeople, public figures and political activists) should build a “digital consensus” of sorts—a shared understanding of goals, approaches and tools for digital life development based on well-developed competencies in the following four areas:

1. Strategic thinking in the age of digital transformation. How to develop realistic and effective long-term plans in an age of “constant change”?¹² What new value

Fig. 9. Areas for Acceleration as a Result of a Region’s Digital Transformation



¹² For more details, see Orlovsky, V., Korovkin, V. *From a Rhinoceros to a Unicorn. How to Lead a Large Company Through Transformation in the Digital Age and Avoid Deadly Traps*. M., Bombara, 2020 (in print)

- could be created for “digital residents” of a city/region? How to set priorities in the face of limited resources and a large number of unresolved social and economic problems?
2. Understanding of the technological basis of digital transformation. What technologies could be used to effectively solve already established strategic tasks? How to distinguish truly promising innovations from endless dead-end ideas hiding behind fancy names?
 3. Digital project management. How to set tasks for developers and accept work when creating novel systems that have no comparable counterparts in the world?
 4. Leadership and communications. How to manage the public agenda effectively in the age of a fragmented media landscape, the erosion of credibility, “information bubbles” and “fake news”? How to achieve leadership in a continuous open discussion with no formal hierarchies and constant interaction with numerous equal stakeholders?

This list shows that digital transformation is not limited to changes in environments,

markets or business models, but also requires deep personal change. The great yachtsman Bruno Peyron used to say that one cannot go through a storm and come out of it unchanged, which could also be applied to the “storms” of the digital age.

What are the benefits that accrue to a region from a well-developed digital life? What can be gained from secondary digitalisation? The previous study by the Moscow School of Management SKOLKOVO already demonstrated that digital technologies matter a lot when it comes to the general perceived quality of the urban environment. They are turning into key competitive tools for cities and regions in national and global human capital markets, helping them to attract, develop and retain successful, ambitious and innovative people who can give a fresh impetus to a region’s social and economic development. Therefore, the bridging of the digital divide is not the proverbial “icing on the cake”, something you could deal with after solving pressing social and economic issues, but an integral part of the comprehensive answer to the challenges faced by every region in Russia.

Appendix 1. Digital Life Index Metrics



To analyse demand, the researchers used data indicating the degree of activity and interest of Internet users in the existing digital infrastructure. Firstly, they estimated the number of search queries in Google and Yandex regarding the digital services that city residents were interested in. The average number of queries per month over the year preceding the period of data collection was analysed taking into account the distribution of the audience for specific cities. Secondly, city residents' activity in social networks was evaluated. To do this, the total audience of social networks (VK, Facebook, OK.ru and My World@Mail.Ru) was analysed, broken down by city.

To analyse supply, the researchers used data indicating the presence and the degree of development of digital services in the cities under consideration. In particular, they examined features of Internet resources related to the areas covered by the research, namely hospital web-sites and the official portals of local administrations. Portal usability and completeness of services provided were taken into consideration. The number of services offered by the regional portals of state and municipal services, as well as the number of massive open online courses (MOOC) provided by local universities and other higher educational institutions located in the cities under analysis, were considered separately. To assess the development of digital infrastructure in finance and retail, a number of bank branches with the highest quality digital offering (the top ten of the Internet Banking Rank—Markswobb Rank & Report) and the pick-up points of online stores (the top five of the Forbes list and the top ten stores according to <http://www.ruward.ru/ecommerce-index-2015/>) were considered for each of the cities. Assessment of supply in media was carried out on a sample of

the top five online media outlets for each city, with the selection based on the regional media citation index (http://www.mlg.ru/ratings/regional_media/3745/0/0/2/).

The obtained results were normalised based on populations of specific cities. The city's final score for 2014 was determined by the average position in the rankings for each dimension (based on the following calculations: 1st place = 1 point, last place = 0 points), and the score for 2015 was determined against the 2014 ranks (thus, values of more than 1 and less than 0 were possible).

This methodology was adapted to the objective of researching secondary digitalisation in all Russian regions. The list of metrics comprising the index was somewhat reduced due to unavailability for certain small regional centres. The sample included not only capital cities of federal constituent entities but also major second cities in some regions, namely: Volzhsky (Volgograd Region), Naberezhnye Chelny (Republic of Tatarstan), Nizhny Tagil (Sverdlovsk Region), Novokuznetsk (Kemerovo Region), Sochi (Krasnodar Krai), Surgut (Khanty-Mansiysk Autonomous Okrug), Tolyatti (Samara Region), and Cherepovets (Vologda Region).

Description of Digital Divide Determinants.

The assessment of factors influencing the level of secondary digitalisation and determining the digital divide was based on the model by Dasgupta et al.: (1) income level, (2) human capital, and (3) regional digitalisation policy. The first factor is relatively easy to describe, as it uses objective metrics like GRP per capita¹³ and its dynamics. The human capital factor can be described from three perspectives: overall

¹³ Rosstat data used everywhere unless data source indicated specifically

Table. Primary Metrics Used in the Digital Life Index

	Supply	Demand
Transportation	<ol style="list-style-type: none"> 1. Availability of Yandex.Transport or a similar service 2. Availability of electronic timetables at bus stops 	Search queries “transport timetable, bus timetable, bus/trolleybus/tram/fixed-route taxi van/marshrutka route, Yandex transport, Smart transport” and related variations—Wordstat Yandex, number of queries for July 28–August 27, 2018
Finance	Number of bank branches from the 2018 Internet Banking Rank—Markswobb Rank & Report (the top ten banks from the ranking) per 1,000,000 people	Search queries “online/internet/mobile banking/loan/credit” and all queries containing these word combinations—Wordstat Yandex, number of queries per 1,000 people for August 02–September 01, 2018
Retail	Number of pick-up points of online stores from the Forbes list (Top 5) + a network of parcel terminals* (2018) per 1,000,000 people	Search query “online store” and all queries containing this word combination excluding words “open, create”—Wordstat Yandex, number of queries per 1,000 people for August 09–September 08, 2018
Healthcare	<ol style="list-style-type: none"> 1. Ability to make an appointment with a paediatrician on gosuslugi.ru 2. Ability to make an appointment with a general physician on gosuslugi.ru 	<ol style="list-style-type: none"> 1. Search query “doctor appointment/make an appointment/polyclinic” and related variations—Wordstat Yandex, number of queries per 1,000 people for August 10–September 09, 2018 2. Search query “buy medicine, activated charcoal, pancreatin, xylometazoline, chlorhexidine, fluconazole, ibuprofen, omeprazole, hydrogen peroxide, bisoprolol, acetylsalicylic, aspirin, band aid, quamatel, paracetamol, nemozole” and related variations—Wordstat Yandex, number of queries per 1,000 people for August 10–September 09, 2018
Education	<ol style="list-style-type: none"> 1. Number of universities offering distance education (DE) listed on http://vuz.edunetwork.ru/dist/?spec=0 per 1,000,000 people 2. Number of universities listed on http://vuz.edunetwork.ru/ per 1,000,000 people 	
Media	Number of online media outlets in Yandex.News aggregator per 1,000,000 people	<ol style="list-style-type: none"> 1. Activity on social networks—VK audience (statistics from VK’s advertising campaign planner) per 1,000 people 2. Activity on social networks—Facebook audience (statistics from Facebook’s advertising campaign planner) per 1,000 people
Administration	Features of city administrations’ web pages (per the check-list)	Region’s 14+ population connected to ESIA (Gosuslugi) as of April 1, 2018 (per constituent entities of the Russian Federation)

demographic dynamics (regional population and its dynamics), population age structures (median age), and education quality (the number of universities in the region^{xviii}—absolute and per 1,000 residents—and the overall ranking of regional universities^{xix} and their average rank). The most difficult problem was finding the metrics that would describe the quality of regional digital policy. There are no direct quantitative comparisons in this area at this time, which is why it was decided to examine a number of proxy metrics describing the general political situation: quality of life in the region,^{xx} quality of the urban environment,^{xxi} the governor's time in the office, the governor's position in national rankings,^{xxii} and the performance of United Russia (the ruling party) and Yabloko (the largest liberal party) in the State Duma elections of 2016.

The relative weight of factors was determined using the method of linear regression. Given a large number of possible metrics, a correlation analysis was performed at the first stage to eliminate metrics with obviously weak impact. Based on the results of this analysis, the following metrics remained: GRP per capita (x_1), region's population (x_2), median age (x_3), number of universities (x_4), overall university rank (x_5), quality of urban environment (x_6), governor's time in the office (x_7),

governor's position in the National Ranking of Governors (x_8), and performance of United Russia (x_9) and Yabloko (x_{10}). Based on these metrics, a regression analysis was performed using three output variables: overall digital life index, demand index value, and supply index value. This resulted in the following equations:

Overall index: $y = 8.27 \cdot 10^{-8}x_1 + 9.71 \cdot 10^{-9}x_2 + 1.83 \cdot 10^{-3}x_3 - 7.85 \cdot 10^{-3}x_4 + 9.49 \cdot 10^{-3}x_5 - 1.61 \cdot 10^{-4}x_6 + 2.58 \cdot 10^{-6}x_7 - 9.34 \cdot 10^{-4}x_8 - 1.81 \cdot 10^{-3}x_9 - 6.89 \cdot 10^{-3}x_{10} + 1.86 \cdot 10^{-1}$. Coefficient of determination $R^2 = 0.388$

Demand: $y = 6.73 \cdot 10^{-8}x_1 - 4.27 \cdot 10^{-10}x_2 + 4.49 \cdot 10^{-3}x_3 - 1.46 \cdot 10^{-2}x_4 + 1.08 \cdot 10^{-2}x_5 - 1.52 \cdot 10^{-4}x_6 - 1.85 \cdot 10^{-6}x_7 - 1.19 \cdot 10^{-3}x_8 - 1.74 \cdot 10^{-3}x_9 - 8.59 \cdot 10^{-3}x_{10} + 4.58 \cdot 10^{-2}$. Coefficient of determination $R^2 = 0.297$

Supply: $y = 9.81 \cdot 10^{-8}x_1 + 1.99 \cdot 10^{-8}x_2 - 8.37 \cdot 10^{-4}x_3 - 1.07 \cdot 10^{-3}x_4 + 8.21 \cdot 10^{-3}x_5 - 1.70 \cdot 10^{-4}x_6 + 7.00 \cdot 10^{-6}x_7 - 6.77 \cdot 10^{-4}x_8 - 1.88 \cdot 10^{-3}x_9 - 5.20 \cdot 10^{-3}x_{10} + 3.26 \cdot 10^{-1}$. Coefficient of determination $R^2 = 0.435$

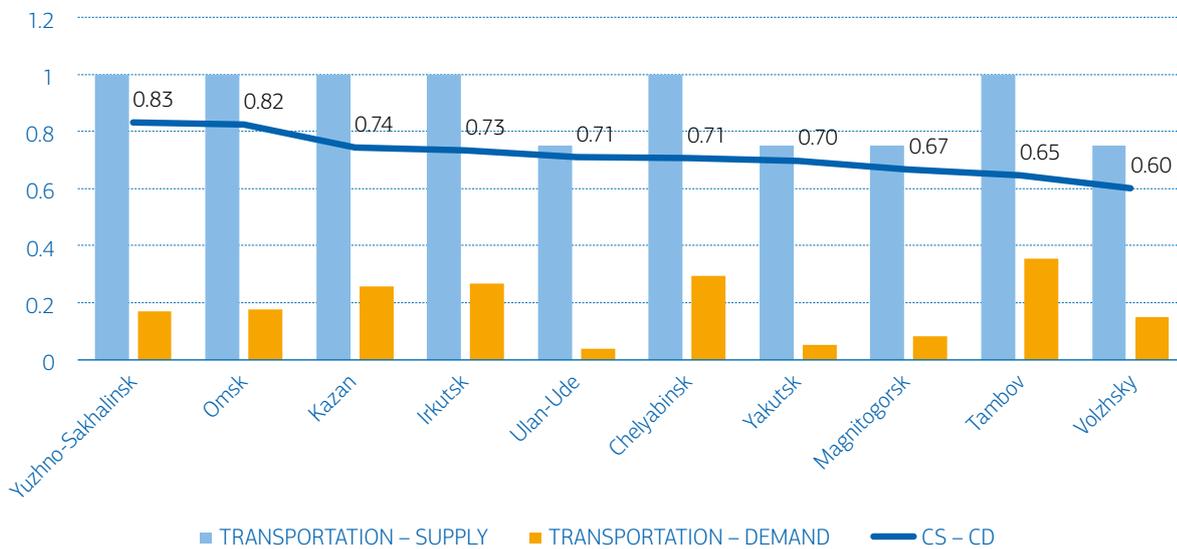
These equations show that economic factors do not play a significant role in the development of secondary digitalisation, which is instead determined by such factors as human capital and policy quality. These results correlate with the data from previous international studies.

Appendix 2. Leading and Lagging Cities in Terms of the Supply and Demand Ratio per Digital Life Dimensions

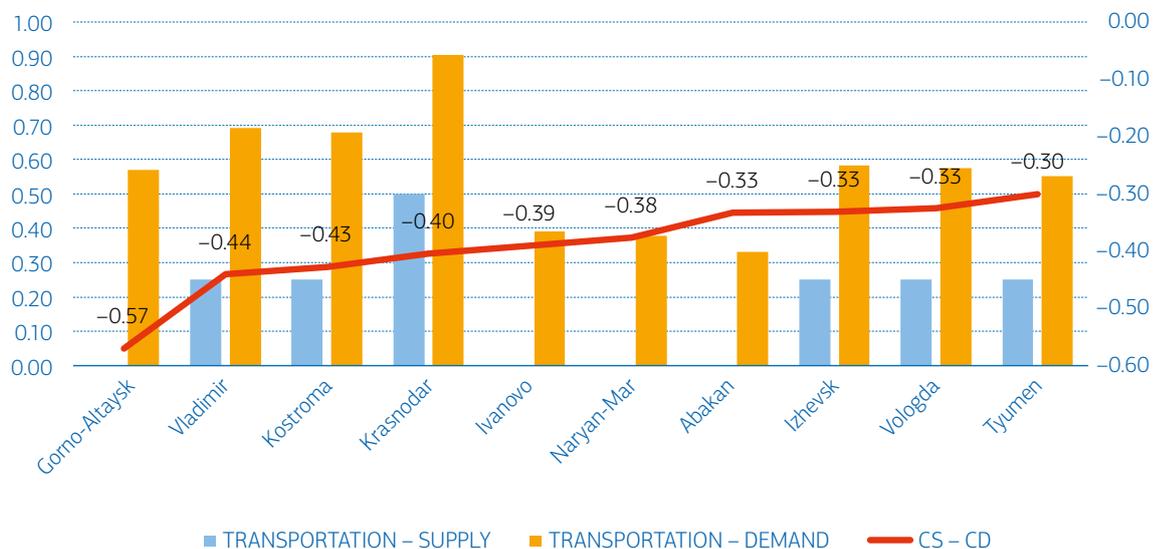


1. Transportation

10 Leaders in Terms of Demand Satisfaction

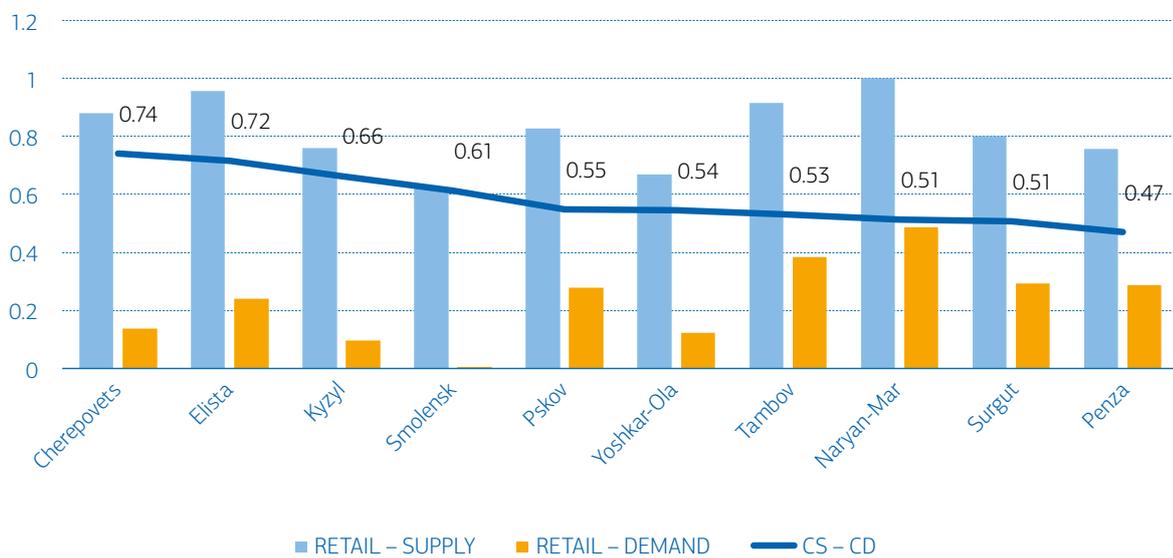


10 Laggards in Terms of Demand Satisfaction

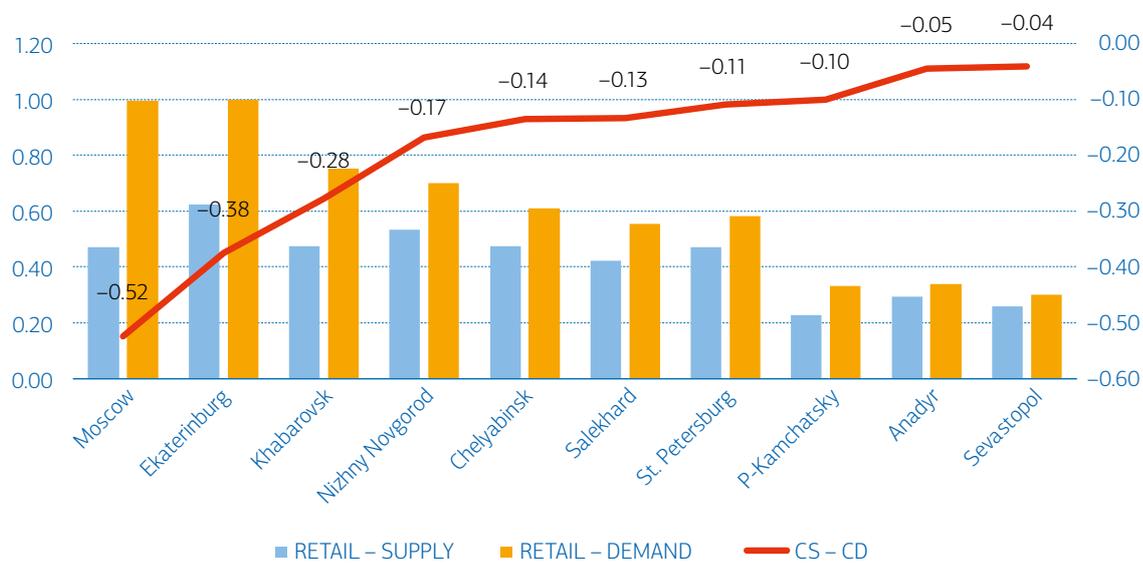


2. Retail

10 Leaders in Terms of Demand Satisfaction

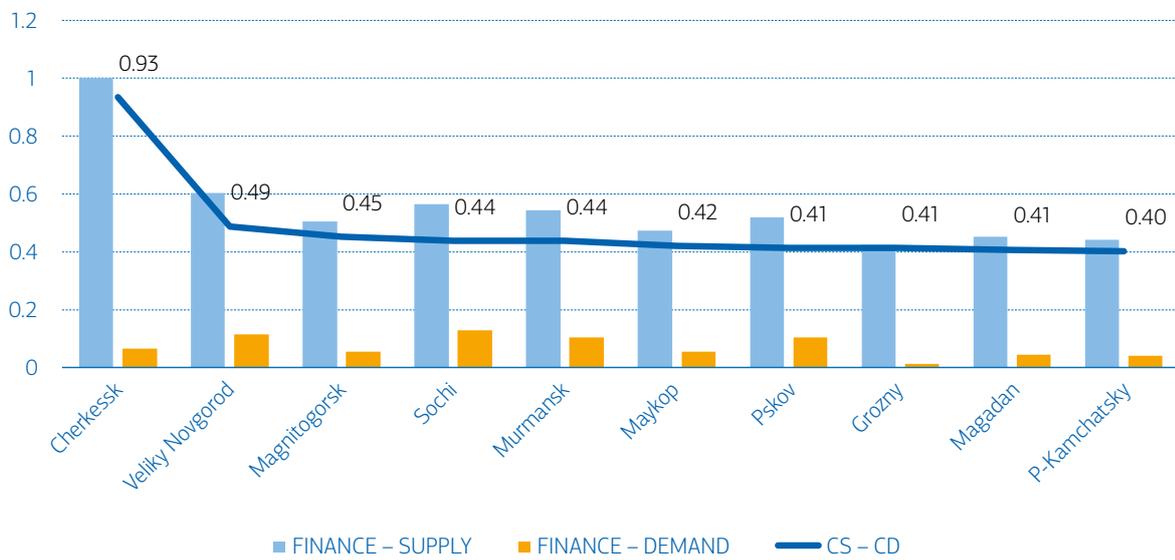


10 Laggards in Terms of Demand Satisfaction

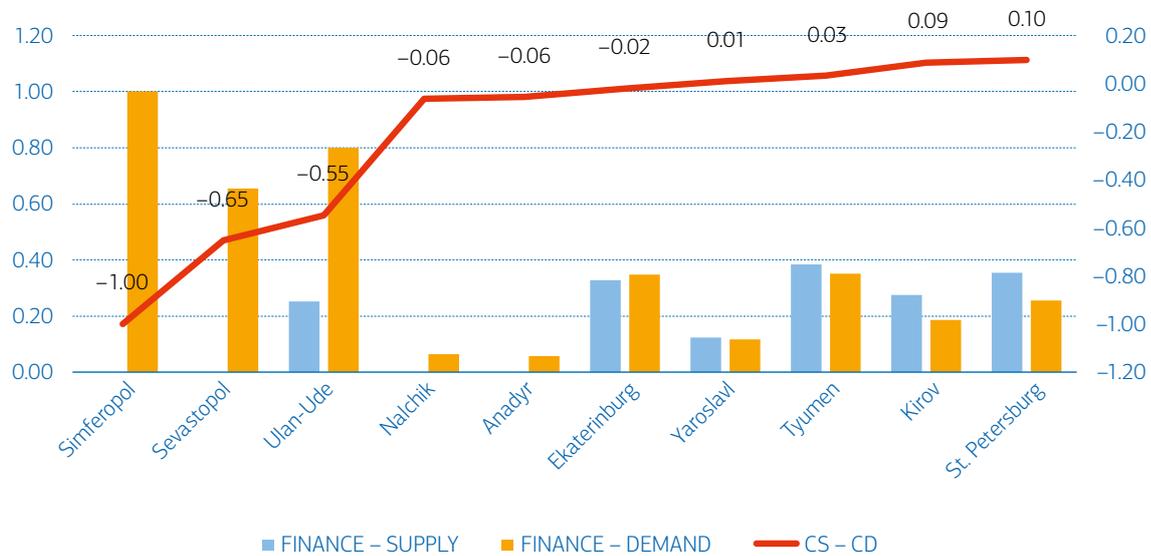


3. Finance

10 Leaders in Terms of Demand Satisfaction

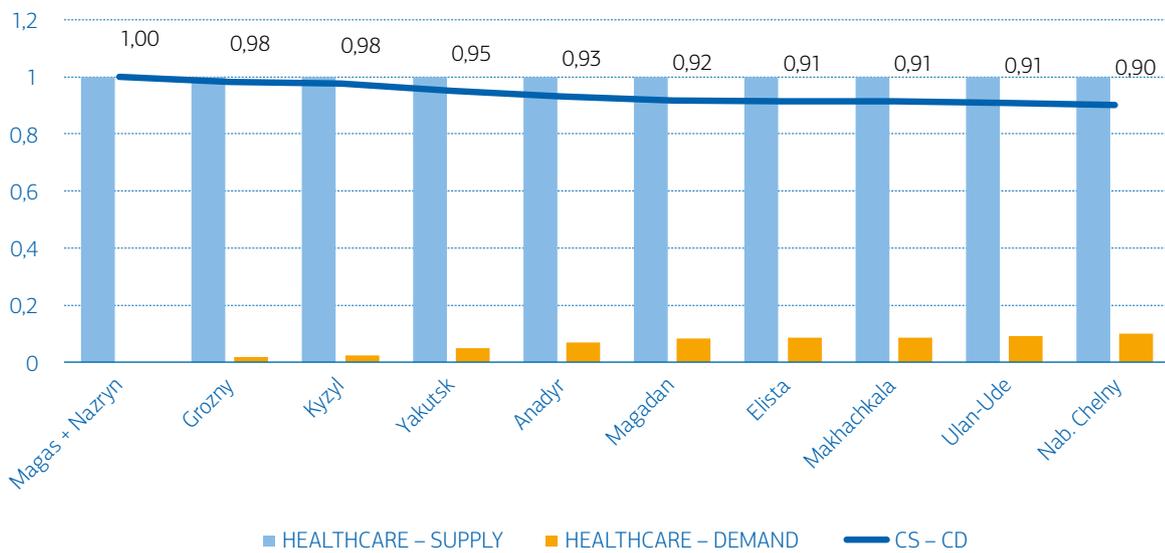


10 Laggards in Terms of Demand Satisfaction

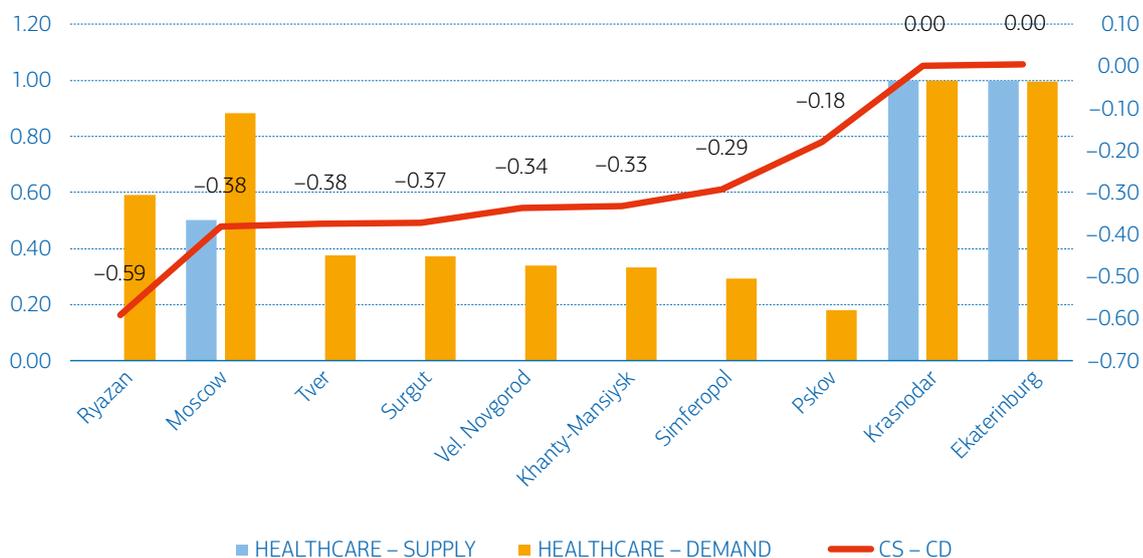


4. Healthcare

Top 10 in Terms of Demand Satisfaction

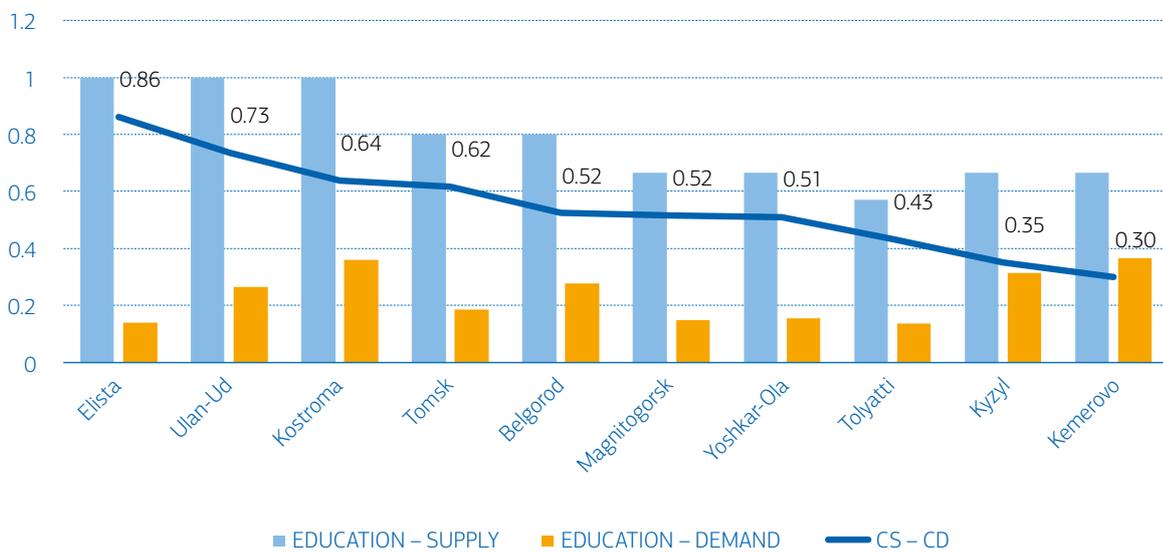


10 Laggards in Terms of Demand Satisfaction

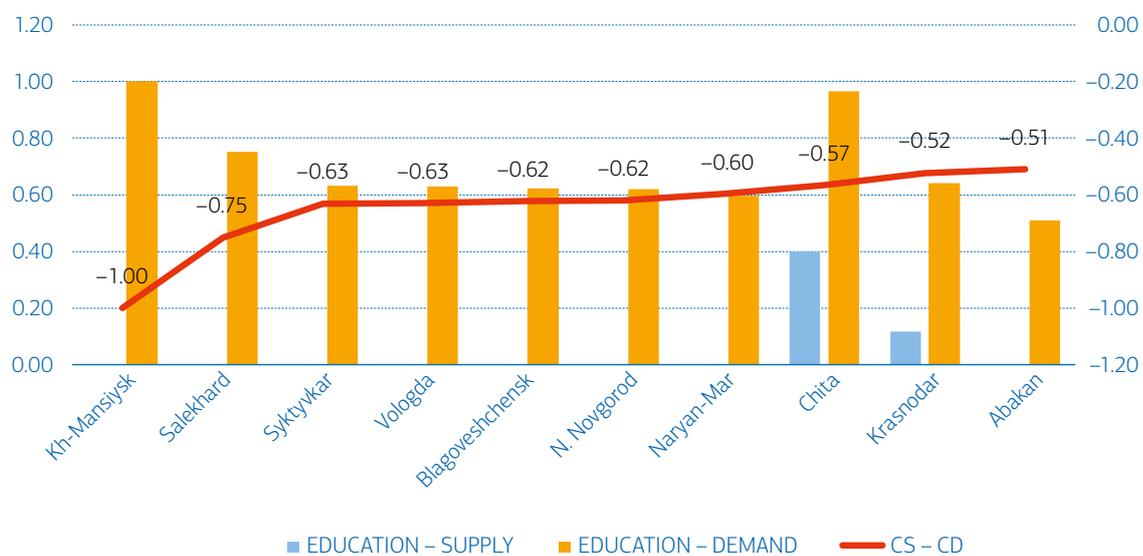


5. Education

10 Leaders in Terms of Demand Satisfaction

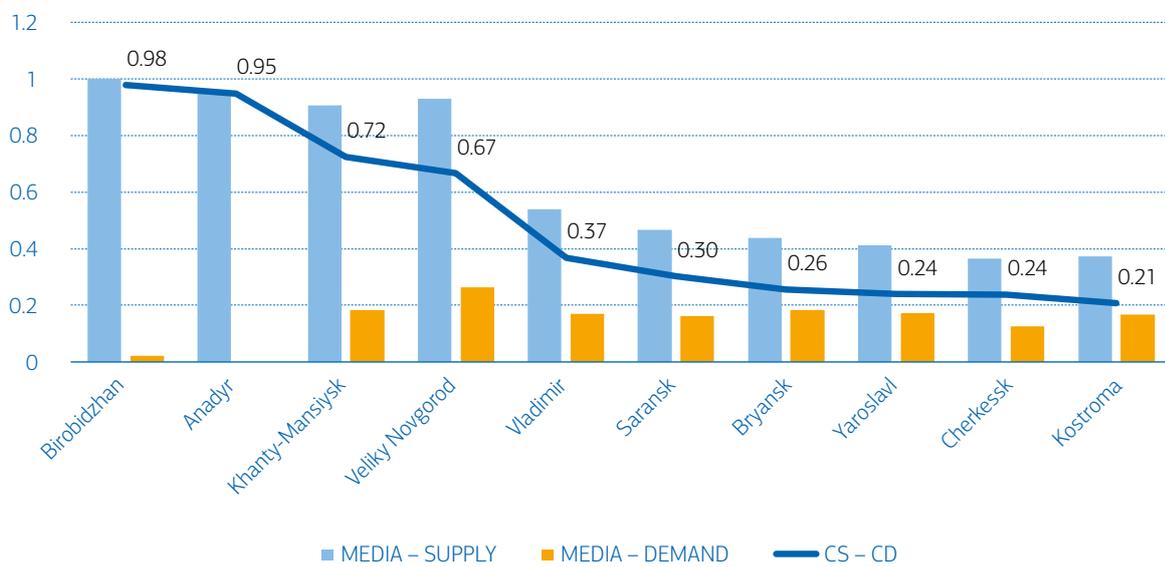


10 Laggards in Terms of Demand Satisfaction

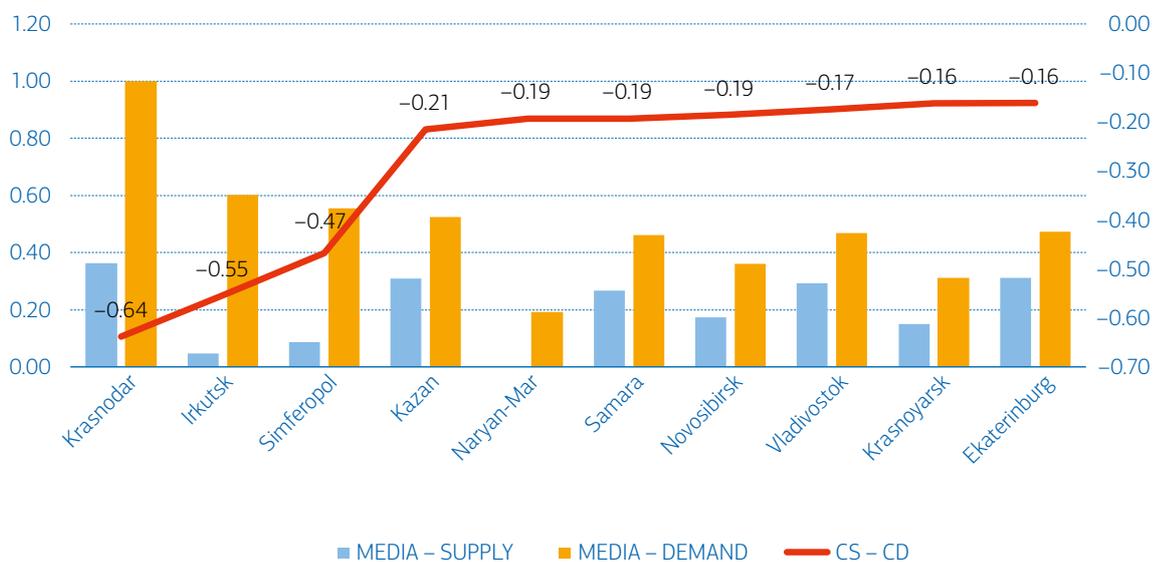


6. Media

Top 10 in Terms of Demand Satisfaction

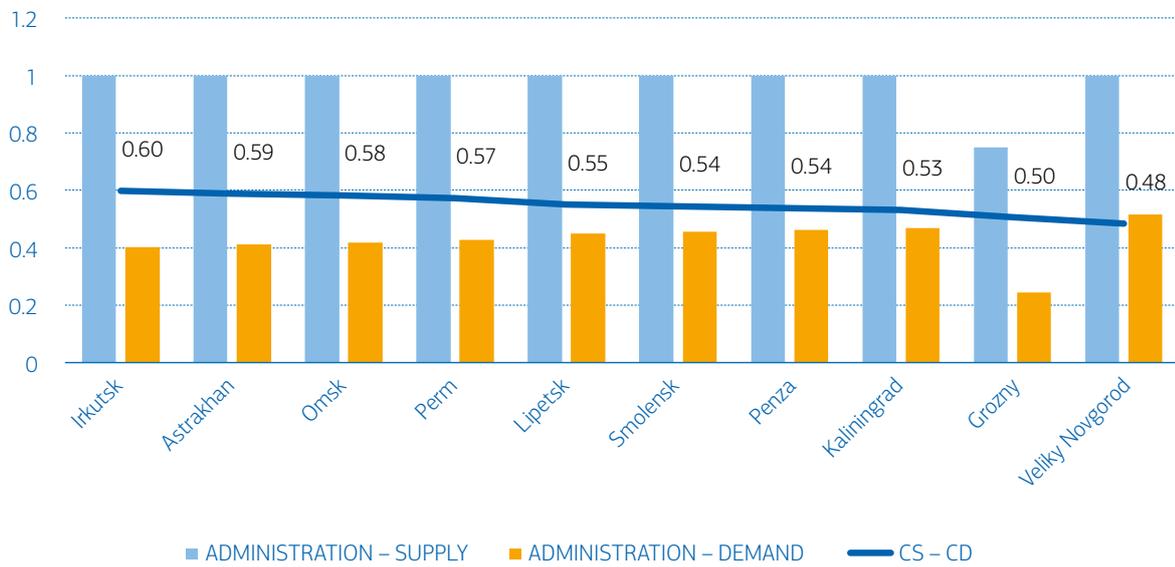


10 Laggards in Terms of Demand Satisfaction

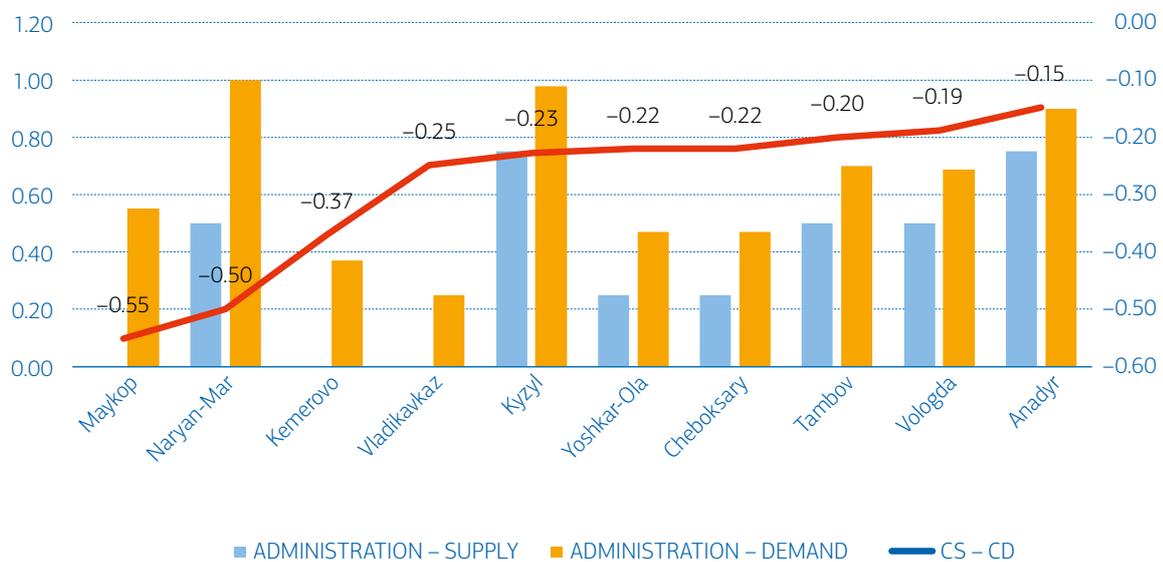


7. Administration

10 Leaders in Terms of Demand Satisfaction



10 Laggards in Terms of Demand Satisfaction



Table

City	Transport supply	Transport demand	Finance supply	Finance demand	Retail supply	Retail demand	Healthcare supply	Healthcare demand	Education supply	Education demand	Media supply	Media demand	Administration supply	Administration demand	Total supply	Total demand	Total
Moscow	1,00	0,57	0,32	0,19	0,47	0,99	0,50	0,88	0,41	0,36	0,50	0,37	0,75	0,33	0,53	0,56	0,55
St. Petersburg	1,00	0,53	0,35	0,26	0,47	0,58	1,00	0,75	0,22	0,33	0,27	0,42	0,75	0,38	0,46	0,58	0,52
Novosibirsk	1,00	0,44	0,43	0,24	0,54	0,44	1,00	0,58	0,48	0,58	0,17	0,36	0,75	0,47	0,44	0,62	0,53
Yekateriburg	1,00	0,77	0,33	0,35	0,62	1,00	1,00	1,00	0,28	0,65	0,31	0,47	0,75	0,45	0,67	0,61	0,64
N. Novgorod	0,75	0,75	0,43	0,25	0,53	0,70	1,00	0,78	0,00	0,62	0,29	0,31	0,75	0,43	0,55	0,54	0,54
Kazan	1,00	0,26	0,36	0,16	0,44	0,15	1,00	0,21	0,44	0,28	0,31	0,52	0,75	0,63	0,32	0,61	0,46
Chelyabinsk	1,00	0,29	0,32	0,14	0,48	0,61	1,00	0,37	0,21	0,34	0,22	0,34	1,00	0,52	0,37	0,60	0,49
Omsk	1,00	0,18	0,46	0,10	0,32	0,15	1,00	0,34	0,53	0,27	0,16	0,20	1,00	0,42	0,24	0,64	0,44
Samara	1,00	0,51	0,44	0,25	0,48	0,42	1,00	0,51	0,25	0,54	0,27	0,46	1,00	0,55	0,46	0,63	0,55
Rostov on Don	1,00	0,44	0,34	0,20	0,58	0,51	1,00	0,61	0,00	0,45	0,34	0,33	1,00	0,62	0,45	0,61	0,53
Ufa	0,25	0,19	0,45	0,20	0,52	0,24	1,00	0,32	0,25	0,45	0,26	0,38	0,50	0,51	0,33	0,46	0,39
Krasnoyarsk	0,25	0,37	0,44	0,18	0,53	0,27	1,00	0,32	0,15	0,49	0,15	0,31	0,75	0,31	0,32	0,47	0,39
Perm	1,00	0,76	0,37	0,16	0,42	0,43	1,00	0,30	0,11	0,43	0,25	0,35	1,00	0,43	0,41	0,59	0,50
Voronezh	0,75	0,34	0,28	0,13	0,37	0,41	1,00	0,56	0,16	0,31	0,34	0,23	0,50	0,59	0,37	0,49	0,43
Volgograd	0,75	0,26	0,39	0,10	0,55	0,22	1,00	0,22	0,00	0,32	0,36	0,23	0,75	0,41	0,25	0,54	0,40
Krasnodar	0,50	0,90	0,50	0,32	0,80	0,74	1,00	1,00	0,12	0,64	0,36	1,00	0,75	0,37	0,71	0,58	0,64
Saratov	0,25	0,34	0,35	0,14	0,47	0,29	1,00	0,35	0,00	0,37	0,37	0,24	0,75	0,39	0,30	0,46	0,38
Tyumen	0,25	0,55	0,38	0,35	0,58	0,35	1,00	0,32	0,75	0,48	0,25	0,24	0,75	0,63	0,42	0,57	0,49
Togliatii	0,25	0,14	0,33	0,09	0,39	0,11	1,00	0,17	0,57	0,14	0,02	0,12	1,00		0,13	0,51	0,33
Izhevsk	0,25	0,58	0,36	0,11	0,49	0,21	1,00	0,90	0,40	0,33	0,21	0,21	0,75	0,68	0,43	0,49	0,46
Barnaul	1,00	0,43	0,45	0,16	0,56	0,23	1,00	0,37	0,17	0,30	0,12	0,19	0,75	0,44	0,30	0,58	0,44
Ulyanovsk	0,25	0,21	0,45	0,09	0,43	0,18	1,00	0,15	0,44	0,19	0,33	0,15	0,75	0,66	0,23	0,52	0,38
Irkutsk	1,00	0,27	0,36	0,15	0,48	0,40	1,00	0,41	0,00	0,38	0,05	0,60	1,00	0,40	0,37	0,56	0,46
Khabarovsk	0,75	0,30	0,34	0,15	0,47	0,75	1,00	0,31	0,15	0,55	0,22	0,22	0,75	0,53	0,40	0,53	0,46
Yaroslavl	0,75	0,86	0,12	0,12	0,69	0,38	1,00	0,38	0,14	0,26	0,41	0,17	0,50	0,37	0,36	0,52	0,44
Vladivostok	0,75	0,30	0,36	0,07	0,58	0,34	1,00	0,25	0,50	0,36	0,29	0,47	1,00	0,60	0,34	0,64	0,49
Makhachkala	0,00	0,02	0,18	0,01	0,10	0,05	1,00	0,09	0,00	0,06	0,15	0,20	0,75	0,73	0,17	0,31	0,24
Tomsk	0,75	0,20	0,45	0,09	0,42	0,12	1,00	0,20	0,80	0,18	0,15	0,22	0,75	0,38	0,20	0,62	0,41
Orenburg	0,25	0,26	0,43	0,15	0,59	0,28	1,00	0,31	0,33	0,52	0,21	0,24	0,75	0,52	0,33	0,51	0,42
Kemerovo	0,50	0,69	0,44	0,12	0,61	0,24	1,00	0,36	0,67	0,37	0,24	0,17	0,00	0,37	0,33	0,49	0,41
Novokuznetsk	1,00	0,64	0,37	0,09	0,52	0,14	1,00	0,24	0,00	0,18		0,12	0,50		0,24	0,57	0,40
Ryazan	0,75	0,48	0,29	0,12	0,64	0,45	0,00	0,59	0,00	0,35	0,27	0,15	0,75	0,42	0,37	0,39	0,38

Table

City	Transport supply	Transport demand	Finance supply	Finance demand	Retail supply	Retail demand	Healthcare supply	Healthcare demand	Education supply	Education demand	Media supply	Media demand	Administration supply	Administration demand	Total supply	Total demand	Total
Astrakhan	0,50	0,08	0,31	0,10	0,47	0,15	1,00	0,11	0,00	0,17	0,19	0,13	1,00	0,41	0,17	0,50	0,33
N.Chelny	0,25	0,12	0,29	0,10	0,36	0,08	1,00	0,10	0,00	0,11		0,22	0,50		0,12	0,40	0,26
Panza	0,75	0,26	0,40	0,12	0,76	0,29	1,00	0,30	0,00	0,30	0,34	0,19	1,00	0,46	0,28	0,61	0,44
Lipetsk	0,50	0,54	0,45	0,11	0,55	0,33	1,00	0,27	0,00	0,31	0,23	0,15	1,00	0,45	0,31	0,53	0,42
Kirov	0,75	0,51	0,27	0,18	0,52	0,33	1,00	0,18	0,44	0,50	0,35	0,23	0,50	0,53	0,35	0,55	0,45
Cheboksary	0,75	0,27	0,35	0,13	0,46	0,15	1,00	0,15	0,20	0,18	0,12	0,23	0,25	0,47	0,23	0,45	0,34
Tula	0,50	0,33	0,45	0,22	0,69	0,66	1,00	0,41	0,60	0,32	0,28	0,20	0,75	0,74	0,41	0,61	0,51
Kaliningrad	0,75	0,50	0,49	0,10	0,24	0,25	1,00	0,31	0,00	0,14	0,28	0,39	1,00	0,47	0,31	0,54	0,42
Kursk	0,25	0,37	0,37	0,12	0,64	0,36	1,00	0,22	0,36	0,15	0,30	0,16	0,75	0,78	0,31	0,52	0,42
Ulan Ude	0,75	0,40	0,00	0,65	0,26	0,30	1,00	0,19	0,00	0,11	0,24	0,24	0,75	0,37	0,32	0,43	0,38
Stavropol	0,75	0,04	0,25	0,80	0,23	0,08	1,00	0,09	1,00	0,27	0,14	0,18	1,00	0,67	0,30	0,62	0,46
Sochi	0,50	0,37	0,40	0,20	0,67	0,47	1,00	0,43	0,00	0,48	0,38	0,41	0,50	0,52	0,41	0,49	0,45
Tver	1,00	0,56	0,57	0,13	0,57	0,41	1,00	0,43	0,00	0,27		0,23	0,75		0,34	0,65	0,49
Magnitogorsk	0,75	0,39	0,48	0,13	0,75	0,77	0,00	0,38	0,00	0,30	0,35	0,19	0,75	0,33	0,36	0,44	0,40
Ivanova	0,75	0,08	0,50	0,05	0,51	0,15	0,50	0,15	0,67	0,15		0,16	0,75		0,12	0,61	0,37
Bryansk	0,00	0,39	0,39	0,10	0,74	0,34	1,00	0,20	0,20	0,18	0,22	0,13	0,75	0,32	0,24	0,47	0,35
Belgorod	0,25	0,33	0,47	0,10	0,74	0,36	1,00	0,37	0,00	0,27	0,44	0,18	0,75	0,32	0,28	0,52	0,40
Surgut	0,50	0,43	0,44	0,17	0,74	0,49	1,00	0,60	0,80	0,28	0,38	0,28	1,00	0,66	0,42	0,69	0,56
Vladimir	0,75	0,23	0,37	0,11	0,80	0,29	0,00	0,37	0,50	0,50		0,21	0,75		0,29	0,53	0,41
N. Tagil	0,25	0,69	0,48	0,11	0,66	0,59	1,00	0,33	0,33	0,38	0,54	0,17	0,25	0,37	0,38	0,50	0,44
Arkhangelsk	0,00	0,24	0,37	0,13	0,40	0,37	1,00	0,20	0,00	0,16		0,09	0,75		0,20	0,42	0,31
Chita	0,75	0,31	0,37	0,12	0,62	0,34	1,00	0,20	0,50	0,39	0,30	0,24	0,75	0,63	0,32	0,61	0,46
Kaluga	0,00	0,09	0,36	0,14	0,24	0,19	1,00	0,23	0,40	0,97	0,13	0,17	0,50	0,38	0,31	0,38	0,34
Smolensk	0,75	0,49	0,00	1,00	0,49	0,52	0,00	0,29	0,00	0,27	0,09	0,55	0,25	0,06	0,46	0,22	0,34
Volzhsky	0,50	0,46	0,33	0,11	0,72	0,66	1,00	0,36	0,00	0,39	0,22	0,19	0,75	0,42	0,37	0,50	0,44
Saransk	0,75	0,48	0,42	0,12	0,62	0,01	1,00	0,41	0,00	0,49	0,31	0,17	1,00	0,46	0,31	0,59	0,45
Kurgan	0,75	0,15	0,41	0,07	0,32	0,09	1,00	0,12	0,00	0,10		0,01	0,75		0,09	0,54	0,31
Cherepovets	0,75	0,17	0,49	0,10	0,61	0,30	1,00	0,44	0,33	0,21	0,47	0,16	0,75	0,59	0,28	0,63	0,45
Oryol	0,25	0,31	0,30	0,13	0,47	0,27	1,00	0,19	0,40	0,39	0,33	0,18	0,75	0,37	0,26	0,50	0,38
Череповец	0,25	0,32	0,38	0,07	0,88	0,14	1,00	0,12	0,00	0,20	0,05	0,19	0,00		0,17	0,37	0,28
Орёл	0,75	0,33	0,56	0,18	0,61	0,44	1,00	0,18	0,22	0,25	0,23	0,19	0,50	0,47	0,29	0,55	0,42
Vologda	0,25	0,58	0,44	0,13	0,69	0,33	1,00	0,35	0,00	0,63	0,47	0,28	0,50	0,69	0,43	0,48	0,45

Таблица

City	Transport supply	Transport demand	Finance supply	Finance demand	Retail supply	Retail demand	Healthcare supply	Healthcare demand	Education supply	Education demand	Media supply	Media demand	Administration supply	Administration demand	Total supply	Total demand	Total
Yakutsk	0,75	0,05	0,35	0,07	0,25	0,10	1,00	0,05	0,00	0,14	0,19	0,31	0,75	0,51	0,18	0,47	0,32
Vladikavkaz	0,00	0,06	0,33	0,06	0,47	0,24	1,00	0,11	0,00	0,10	0,10	0,23	0,00	0,25	0,15	0,27	0,21
Grozny	0,00	0,01	0,42	0,01	0,10	0,00	1,00	0,02	0,00	0,08	0,05	0,19	0,75	0,25	0,08	0,33	0,20
Murmansk	0,75	0,48	0,54	0,10	0,79	0,43	1,00	0,32	0,22	0,39	0,35	0,28	0,75	0,62	0,37	0,63	0,50
Tambov	1,00	0,35	0,49	0,15	0,92	0,38	0,50	0,40	0,29	0,30	0,30	0,20	0,50	0,70	0,36	0,57	0,46
Petrozavodsk	0,25	0,38	0,41	0,10	0,58	0,30	1,00	0,12	0,00	0,35	0,37	0,22	0,75	0,51	0,28	0,48	0,38
Kostroma	0,25	0,68	0,36	0,11	0,80	0,52	1,00	0,34	1,00	0,36	0,37	0,17	0,75	0,53	0,39	0,65	0,52
Yoshkar-Ola	0,75	0,19	0,47	0,08	0,67	0,12	1,00	0,36	0,67	0,16	0,11	0,24	0,25	0,47	0,23	0,56	0,39
Syktvykar	0,25	0,43	0,48	0,15	0,63	0,38	1,00	0,14	0,00	0,63	0,24	0,24	1,00	0,59	0,36	0,51	0,44
Nalchik	0,00	0,08	0,00	0,06	0,44	0,19	1,00	0,16	0,00	0,15	0,06	0,15	0,50	0,40	0,17	0,29	0,23
Blagoveschensk	0,50	0,15	0,45	0,08	0,51	0,22	1,00	0,30	0,00	0,62	0,20	0,21	0,75	0,45	0,29	0,49	0,39
V. Novgorod	1,00	1,00	0,60	0,12	0,84	0,38	0,00	0,34	0,00	0,24	0,93	0,26	1,00	0,52	0,41	0,62	0,52
Pskov	0,75	0,56	0,52	0,10	0,83	0,28	0,00	0,18	0,00	0,28	0,35	0,23	0,75	0,33	0,28	0,46	0,37
Yuzhno-Sakhalinsk	1,00	0,17	0,38	0,07	0,49	0,47	1,00	0,16	0,00	0,35	0,07	0,14	0,75	0,74	0,30	0,53	0,41
Abakan	0,00	0,33	0,41	0,14	0,66	0,35	1,00	0,18	0,00	0,51	0,24	0,23	0,75	0,57	0,33	0,44	0,38
Petropavlovsk Kamchatsky	0,25	0,14	0,44	0,04	0,23	0,33	1,00	0,10	0,00	0,21	0,25	0,12	0,75	0,53	0,21	0,42	0,31
Maikop	0,00	0,17	0,47	0,05	0,54	0,15	1,00	0,15	0,00	0,07	0,21	0,11	0,00	0,55	0,18	0,32	0,25
Cherkessk	0,00	0,13	1,00	0,07	0,54	0,17	1,00	0,12	0,00	0,11	0,36	0,13	0,75	0,30	0,15	0,52	0,33
Kyzyl	0,25	0,03	0,43	0,24	0,76	0,10	1,00	0,02	0,67	0,31	0,38	0,18	0,75	0,98	0,27	0,61	0,44
Elista	0,00	0,09	0,45	0,09	0,96	0,24	1,00	0,09	1,00	0,14	0,29	0,20	0,50	0,49	0,19	0,60	0,39
Khanty-Mansiisk	0,75	0,29	0,43	0,20	0,72	0,64	0,00	0,33	0,00	1,00	0,91	0,18	1,00	0,87	0,50	0,54	0,52
Magadan	0,00	0,07	0,45	0,04	0,30	0,18	1,00	0,08	0,00	0,18	0,00	0,15	1,00	0,67	0,20	0,39	0,29
Birobidjan	0,00	0,28	0,40	0,06	0,52	0,27	0,50	0,02	0,00	0,25	1,00	0,02	1,00	0,65	0,22	0,49	0,35
Gorno-Altaysk	0,00	0,57	0,40	0,14	0,64	0,35	1,00	0,16	0,00	0,29	0,23	0,17	0,75	0,75	0,35	0,43	0,39
Salekhard	0,00	0,11	0,34	0,24	0,42	0,55	1,00	0,26	0,00	0,75	0,30	0,13	0,75	0,81	0,41	0,40	0,41
Naryan Mar	0,00	0,38	0,34	0,13	1,00	0,49	1,00	0,14	0,00	0,60	0,00	0,19	0,50	1,00	0,42	0,41	0,41
Anadyr	0,00	0,02	0,00	0,06	0,29	0,34	1,00	0,07	0,00	0,45	0,95	0,00	0,75	0,90	0,26	0,43	0,34
Magas + Nazran	0,50	0,00	0,30	0,00	0,00	0,01	1,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,26	0,13



Notes



- ⁱ FALLING THROUGH THE NET: DEFINING THE DIGITAL DIVIDE. A Report on the Telecommunications and Information Technology Gap in America. National Telecommunications and Information Administration • U.S. DEPARTMENT OF COMMERCE. July 1999. <https://www.ntia.doc.gov/legacy/ntiahome/ftn99/FTTN.pdf>
- ⁱⁱ Gallardo R. (2017) 2015 County-Level & Census Tract Digital Divide Index. Technical Report; Gallardo R., Beaulieu L., Kumar I. (2018) Digital Divide in the US. Purdue University, Research & Policy Insights, Issue 3.
- ⁱⁱⁱ See the topic of national digital strategies (Коровкин, 2019; Korovkin, 2019)
- ^{iv} *Digital Life of Russian Megapolises*. Moscow School of Management SKOLKOVO. 2016.
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- ^{ix} Norris, Ibid.
- ^x Vehovar, V., Sicherl, P., Husing, T., & Dolnicar, V. (2006). Methodological Challenges of Digital Divide Measurements. *The Information Society*, 22, 279–290.
- ^{xi} Gallardo, R. (2015). 2015 Digital Divide Index. Mississippi State University Intelligent Community Institute
- ^{xii} Dasgupta et al. Ibid.
- ^{xiii} For example, a model including (1) markets, (2) diffusion of innovations, (3) infrastructure, (4) human capital, (5) competitiveness and (6) competition level—in Corrocher, N., & Ordanini, A. (2002). Measuring the Digital Divide: A Framework for the Analysis of Cross-Country Differences. *Journal of Information Technology*, 17, 9–19
- ^{xiv} Chinn, M., & Fairlie, R. (2004). THE DETERMINANTS OF THE GLOBAL DIGITAL DIVIDE: A CROSS-COUNTRY ANALYSIS OF COMPUTER AND INTERNET PENETRATION. Cambridge, MA: NATIONAL BUREAU OF ECONOMIC RESEARCH; Guillen, M., & Suarez, S. (2005). Explaining the Global Digital Divide: Economic, Political and Sociological Drivers of Cross-National Internet Use. *Social Forces*, 84(2)
- ^{xv} Huang, C.-Y., & Chen, H.-N. (2010). Global Digital Divide: A Dynamic Analysis Based on the Bass Model. *Journal of Public Policy & Marketing*, 29(2), 248–264.
- ^{xvi} <https://iems.skolkovo.ru/en/iems/publications/research-reports/1054-2016-11-30/>
- ^{xvii} Corrocher, N., & Ordanini, A. (2002). Measuring the Digital Divide: A Framework for the Analysis of Cross-Country Differences. *Journal of Information Technology*, 17, 9–19; Chinn, M., & Fairlie, R. (2004). THE DETERMINANTS OF THE GLOBAL DIGITAL DIVIDE: A CROSS-COUNTRY ANALYSIS OF COMPUTER AND INTERNET PENETRATION. Cambridge, MA: NATIONAL BUREAU OF ECONOMIC RESEARCH
- ^{xviii} <http://vuzoteka.ru/%D0%B2%D1%83%D0%B7%D1%8B/%D0%B3%D0%BE%D1%80%D0%BE%D0%B4%D0%Bo>
- ^{xix} <http://vuzoteka.ru/%D0%B2%D1%83%D0%B7%D1%8B/%D0%B3%D0%BE%D1%80%D0%BE%D0%B4%D0%Bo>
- ^{xx} Two alternative studies, https://www.domofond.ru/statya/polnyy_reyting_gorodov_rossii_po_kachestvu_zhizni_v_2018_godu/7679 and https://cdnimg.rg.ru/pril/article/162/11/08/73._Kachestvo_zhizni_v_gorodah_Rossii.pdf
- ^{xxi} <https://xn--d1achkm1a.xn--d1aqf.xn--p1ai/>
- ^{xxii} National Ranking of Governors <http://russia-rating.ru/info/16291.html> and Public's Ranking of Governors <https://governors.ru/rating>

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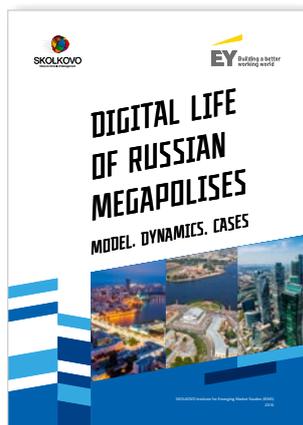
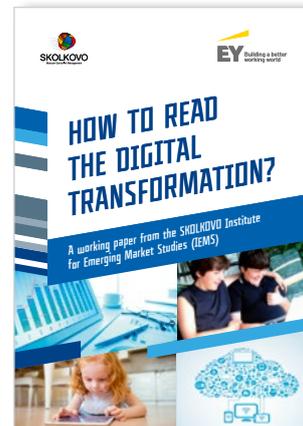
RESEARCH AREAS



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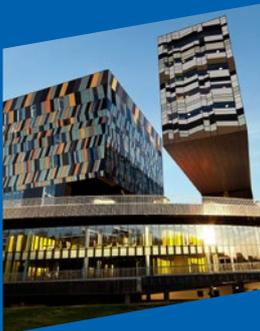
DIGITAL TRANSFORMATION

- Digital transformation of the living environment, of business models and of consumer behavior
- Innovations for, in, and from the emerging economies
- Management, governance, and policy in the digital age



SKOLKOVO Institute for Emerging Market Studies (SKOLKOVO IEMS) was established in 2008 by philanthropist and impact investor **Ruben Vardanyan**, a visionary and a strong believer in the future role of the emerging markets in the global economy. The same year, EY became a strategic partner of IEMS. Under the strategic guidance of **Karl Johansson**, IEMS has developed into an international network uniting research teams in Hong Kong University of Science and Technology and Indian School of Business in Hyderabad.

The research mission of IEMS is to provide business executives and policymakers with insights that help make better strategic decisions in the emerging markets. IEMS conducts applied research and offers advisory services focused on the strategic issues of the global economy, international strategies, sustainable development, and digital transformation and innovation.



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