# DYNAMICS OF DIGITAL COMPONENT INDICATORS OF PEOPLE'S QUALITY OF LIFE IN RUSSIA IN 2015 – 2017

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**Abstract**
The process of digitalization covered all areas of people's life, affecting its quality. Impact of digital transformation is huge, though not yet properly studied. The first step in research of digitalization influence on quality of life should be made through analysis of its qualitative parameters. Six attributes were defined to characterize digital component of people's quality of life: digital competences of people, availability of digital goods, quality of working life and social sphere in conditions of digitalization, state electronic services for people and safety of people informational activities. These attributes are presented by blocks of indicators reflecting the process of digital transformation in Russia in different areas. To exclude interrelated indicator correlation analysis was made, with calculation of paired correlation coefficients. The results of analysis allowed to characterize alterations occurred in the area of digital technologies application within defined blocks of indicators for Russian regions and for the whole country during the period 2015 – 2017. A positive dynamics of indicators of digital component of people's life in Russia was revealed, along with some fluctuations of indicators from region to region. Finally, meaningful interpretation of observed indicators and their alteration was given.

**Keywords**
People's quality of life, quality of labour life, digital transformation, regions of Russia

**JEL Classification**
J01, O18, R10

## Introduction

Digital transformation of economy involves all spheres of people and organizations activities. It suggests the alteration of technological paradigm, traditional markets as well as institutional structure of society, in which it is now necessary to consider interaction of formal and informal, market and non-market institutions as well as those corresponding to digital and non-digital processes etc. The augmented reality means the system which combines real and virtual things with real ones prevailing (World Economic Forum, 2017).
People's quality of life is a multidimensional term and there is no shared vision on it (Litvintseva and Stukalenko, 2014). Basics and specific features of people's quality of life are considered in theoretical works of scientists belonging to classic, neoclassic and Keynesian schools of thought. At the present time the people's quality of life in different interpretations was explored by A. Atkinson, A. Sen, A. Coudouel, J. Hentschel, Q. Wodon, S. Maxwell, T. Shulz, V.R. Shmidt, T. McKinley, N.D. Vavilina, V.N. Bobkov, Z.Z. Biktimirova, V.M. Zherebin, B.Ju. Koval, A.I. Pishnyak, N.M. Rimashevskaya and others.

In general we will consider people's quality of life (PQL) as level of satisfaction of material and cultural needs of people determined by their social experience and environment (Quality of life in Russia and its regions, 2009).
In our days the number of publications concerning digital transformation of society is rising. They are written by U. Isaakson, S. Berinato, S. Greenguard, D. Kahneman, R.G. Cooper, J.A. Moore, M. Reeves, D. Tapscott, E.D. Williams, K. Schwab, E. Schmidt and G. Cohan, P. Erisman, as well by as Russian scientists A.Ju. Bykov, V.I. Ignatyev, A.I. Kovalenko, L.V. Lapidus, M.M. Likina, V.D. Markova, A.A. Troshina, Ya.M. Roshchina, M. Shekhovtsev, S.A. Yablonskiy. This is despite the fact that until now there is no common approach to the set of indicators and methods of quality of life estimation, even without considering digitalization. Statistical and mathematical methods for estimation of different aspects of people's quality of life were modified and elaborated by S.A. Aivazyan, I.I. Eliseeva, L.I. Nivorozhkina, Z.A. Vasilieva, V.V. Glinskiy, E.A. Kolomak, P.M. Kozyreva, A. Kiruta, A. Shevyakov, A.V. Suvorov, V.S. Timofeev, as well as by representatives of mathematical economic school. However in practical international comparisons different indices are used which in one or another way estimate people's quality of life in different countries. The most famous are Human development index, Happiness index, Inclusive Development Index and so on. There were also works estimating quality of life in national economies as well as in separate regions and municipalities (Bobkov et al., 2017).
In modern conditions of augmented reality new approaches to measuring people's quality of life are necessary, which take into account its digital component (Digital Globalization, 2016).

**Indicators**

In the conditions of augmented reality it is necessary to mark attributes of PSL digitalization and to define if necessary information on them divided by regions exists and which method could be applied. Analysis of papers and other information sources on Russian regions allowed to detach different attributes which could be aggregated into 6 blocks: digital competences of people, availability of digital goods, quality of working life and social sphere in conditions of digitalization, state electronic services for people and safety of people informational activities. It should be noted that state electronic services for people and organizations are significant part of modern life and are included in development programs in many countries (Melnikov and Lukashenko, 2017). Each block is characterized by a number of indicators (Quality of life in Russia and its regions, 2009). The article considers 85 regions of the Russian Federation. Data on Arkhangelsk and Tyumen regions were used without taking into account data on the autonomous okrugs on their territories (Abdrahmanova et al., 2017). Temporal period of the research is the years 2015 – 2017.
To detach indicators for blocks the data from the Russian Federal State Statistics Service, National research university "Higher school of economics" and others (Indikatory cifrovoj jekonomiki, 2017; Informacionnoe obshhestvo, 2018; Regiony Rossii, 2018) were used in the research. These data included information from selective people screening on the matters of information technologies and information and telecommunications networks (ICN) use as well as federal statistical observation for ICN use by organizations and output of computing techniques, software and provision of services in these spheres. ICN screening is made by people selective questioning in all subjects of Russia with the subsequent extrapolation of its results on the whole population of appropriate age which allows estimation of ICN use by people both in households and in professional activities. Observation on ICN use by organizations involves legal bodies of nearly all types of economic activities (Informacionnoe obshhestvo, 2018).
Initially 49 indicators reflecting 6 attributes (blocks) digital component of peoples's quality of life. As some of indicators could reflect the same phenomena and be interrelated, they

were subjected to correlation analysis with calculation of paired correlation coefficients to measure strength of relations ship between different pairs of indicators (Timofeev et al, 2009):

$$r_{xy} = \frac{\overline{xy} - \bar{x} \cdot \bar{y}}{\sigma_x \sigma_y}, \quad (1)$$

where: $r_{xy}$ – paired correlation coefficient; $\overline{xy} = \frac{1}{N}\sum_{i=1}^{N}(x_i y_i)$; $\bar{x} = \frac{1}{N}\sum_{i=1}^{N}(x_i)$; $\bar{y} = \frac{1}{N}\sum_{i=1}^{N}(y_i)$; $\sigma_x = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^2}$ – mean square deviation for indicator $x_i$; $\sigma_y = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(y_i - \bar{y})^2}$ – mean square deviation for indicator $y_i$.

In case of paired correlation coefficient higher than 0.7 the conclusion about strong relationship between two indicators was made, then one of them was excluded from consideration basing on the analysis of their relationship with other indicators and their essence. As a result, 12 indicators from different blocks were excluded. As a result, 37 indicators remained, among them 6 ones with negative relation (table no. 1)

**Table no. 1 Quantity of indicators considered in attributes (blocks) of people's life digitalization in Russia**

| Blocks of indicators of people's life digitalization | Selected for correlation analysis | Excluded as a result of correlation analysis | Remained | Among them having | |
|---|---|---|---|---|---|
| | | | | positive relation | negative relation |
| 1. Digital quality of people | 11 | 3 | 8 | 5 | 3 |
| 2. Availability of digital goods for people | 7 | 2 | 5 | 3 | 2 |
| 3. Quality of working life in conditions of digitalization | 8 | 3 | 5 | 5 | – |
| 4. Social sphere and services in conditions of digitalization | 17 | 4 | 13 | 13 | – |
| 5.State electronic services for people quality | 3 | 0 | 3 | 3 | – |
| 6.People informational activities safety | 3 | 0 | 3 | 2 | 1 |
| Total | 49 | 12 | 37 | 31 | 6 |

*Source: own table*

Examples of indicators with positive connection could be people skills of using personal computers, share of households having broadband Internet access, people using Internet for getting state and municipal services etc. Of negative connection are, for example, share of people which do not use Internet, absence of technical abilities of households to connect to Internet, factors restraining people from using Internet by safety reasons.

**Indicators of digital quality of people's life in Russia**

***Digital quality of people***. Available statistical data characterizes people's literacy level for the following types of computer work (as a percent of overall population with age from 15 to 72): using text editors (notable growth from 53% to 60%), using electronic tables (notable growth from 30 to 39%), file transfer between computers and peripheral devices (negligible growth from 38 to39%) and using programs for photo-, video- and audiofiles editing (remained at 29%). The first two indicators represent basic skills of computer literacy, their growth is in good accordance with growth of people share using computers (this indicator is excluded from consideration as a result of correlation analysis). The third and the fourth indicators are more specialized, especially editing photo-, video- and audiofiles, so they are rather "niche" indicators, related to more "advanced" computer users and to specialists in information technologies. Almost all of such users have basic computer skills, but their number is not changing so rapidly as it is observed with inflow of new computer users with basic skills only, causing therefore absence of significant changes of the third and the fourth indicators of people's computer literacy.

***Index of availability of digital goods for people***. Scale of personal computer use in Russian households did not significantly changed during the period of consideration, it increased only by 1.9%, and its value in 2017 was 74.4% of total number of households. The highest value was in Yamalo-Nenets Autonomous Okrug, Khanty-Mansiysk Autonomous Okrug, city of Sankt-Peterburg, the Republic of North Ossetia-Alania and Moscow region. The lowest values were in Chechen Republic, Republic of Adygeya, Chuvash Republic, Kirov and Kurgan regions.

High level of households saturation with personal computers lead to growth of broadband Internet access. In 2017 share of households with broadband Internet access increased by 5.8% comparing to 2015, from 66.8% to 72.6%. The highest value was in Yamalo-Nenets Autonomous Okrug, Khanty-Mansiysk Autonomous Okrug, Republic of Tatarstan, cities of Sankt-Peterburg and Sevastopol. The lowest values were in the Chechen Republic, Chukotka Autonomous Region, Republic of Ingushetia, Republic of Khakassia and Magadan region.

Among households with no access to the Internet the share of those reasoned by absence of technical feasibility to get connection decreased from 7.7% in 2015 to 6.2% in 2017. The share of those without Internet access due to high costs of getting Internet connection also decreased from 12.3% in 2015 to 11.5% in 2017.

So far all these indicator values allow to conclude that full availability of digital technologies for people has still not been reached in Russia. Not all households have personal computers and Internet access. The main cause for absence of Internet access is high costs of getting Internet connection.

***Index of quality of working life in conditions of digitalization.*** Using personal computers in organizations of all types of economic activity in Russia (excluding small enterprises) slightly decreased during the considered period, though remained at quite high level. In 2015 92.3% of surveyed organizations used personal computers, in 2017 this indicator was at 92.1%. In some Russian regions 100% value was reached, namely in the city of Moscow, Republic of Crimea, Republic of Ingushetia. In Voronezh region and Republic of Tatarstan in was at 99.8%. The lowest values were in the city of Sevastopol (69.6%), Republic of

Dagestan (72.5%), Tomsk region (76.6%), Samara region (80.9%) and Novosibirsk region (81.9%).

Despite high level of using personal computers their amount for each 100 workers is not so high. On the whole in Russia the indicator value was 49 in 2015 and 2016, and 50 in 2017. The highest values are in the city of Sankt-Petersburg (60), Novosibirsk region (57), Tomsk region (57), Republic of Altai (56). Such distribution could be explained by structure of Russian economy. For example, Moscow, as the capital of Russia, is its financial, trade and information center, therefore enterprises with a need of high amounts of digital devices prevail there. The same could be said about Novosibirsk and Tomsk regions with high share of scientific centers located there. The lowest numbers of this indicator are in Republic of Dagestan (34), Kemerovo region (36), Kabardino-Balkar Republic (37), Republic of Ingushetia (37) and Yamalo-Nenets Autonomous Okrug (40).

Abundance of computer equipment allowed organizations to use it to create local information networks as well as electronic document flow. Along with it using local information networks in organizations in Russia on the whole decreased from 63.5% from overall number of surveyed organizations in 2015 to 61.1% in 2017, whereas using electronic document flow increased from 62.7% in 2015 to 66.1 in 2017.

Expenditures of organizations on information and communication technologies increased. In 2015 they spent 8.08 mln rubles per 1000 persons, while in 2017 it reached 10.13 mln rubles. Leading place takes Moscow with value of this indicator of 62.47 mln rubles in2017. In other regions this indicators value is notable lower. For example, second place takes Yamalo-Nenets Autonomous Okrug with 38.3 mln rubles. The lowest value is in the Republic of Dagestan, it is only 0.3 mln rubles in 2017.

***Social sphere and services in conditions of digitalization.*** The period 2015-2017 did not show significant growth rates of computers amount as well share of educational institutions having high-speed (broadband) Internet access. The reason could be in active development of this aspect of education digitalization in Russia in the previous years so currently we could speak of saturation achieved in these indicators for educational institutions. Therefore this level of saturation is reflected in statistical data on amounts of computer in educational institutions in 2017 and is equal 15-20 computers per 100 students, i.e. 1 computer per 5-6 students. The same is true for share of educational institutions having Internet sites, currently it is close to 100%.

Significant increase (53% during the considered period of time on average in Russia) was shown by some other indicators of education digitalization, particularly by using technologies of distance learning. Such increase looks like next logical step in education digitalization after educational institutions got necessary tools for that – computers and Internet access (Programma «Cifrovaja jekonomika Rossijskoj Federacii», 2017). It could be expected that this process will lead to increase in number of offers on online education, distant lecture courses etc.

Comparing to education, digitalization of other spheres of social services looks to be delaying. For example, the process of saturation medical institutions with computers and Internet access is still going on, the growth rate of this indicator during the analyzed period was 22% on average in Russia and in 2017 it reached 33 computers per 100 workers of medical institutions, i.e. 1 computer per 3 workers. On one hand, it is higher that corresponding indicator for educational institutions (per 100 students), but target level of saturation in medical institutions also should be higher, perhaps at least 1 computer per 2 workers of medical institutions, so potential growth of this indicator is still at least 50%. Analogous situation is with Internet access – this indicator also demonstrates fast growth (47% on average in Russia during the analyzed period), but in 2017 there were 22 computers with Internet access per 100 workers of medical institutions, i.e. 1 such computer per 4-5 workers, which looks clearly insufficient. As a result, in contrast to educational

institutions, share of medical institutions having web-site is still quite fat from 100% (79% in 2017), though it also shows growth by 18% during 2015-2017.
The same delay could be observed for institutions of culture and museums. Indicators of their digitalization (number of institutions of culture having web-site; share of museum pieces included in electronic catalogue; volume of libraries electronic catalogues etc.) show fast growth, by tens and hundreds percents during the considered period, which is a positive thing by itself but these high growth rates are the consequence of low comparison base, among other things, i.e. low current level of digitalization in this sphere.
Finally, the fast growth of people's share using the Internet to buy goods (64% of growth on average in Russia). It could be considered as the second step of digitalization which started after people (households) in majority got computers and Internet access.
So far all considered indicators of digitalization of social sphere and services allow to state that partially it is in the first stage of digitalization (saturation with computers and growth of Internet access possibilities). This is related to medical institutions and institutions of culture. At the same time, educational institutions are already on the second stage, i.e. using newly got digital capabilities to increase online educational activities. The same situation is with households using new opportunities of digital economy (buying goods through Internet, getting distant services etc.) after getting necessary base presented by computers with Internet access.
***State electronic services for people quality.*** In 2017 significant increase of people's share aged from 15 to 72 who interact with state and local authority bodies in getting services was observed in Russia. In 2014 it was only 29.9% while in 2017 it increased to 65.7%, i.e. more than 2 times. Among people getting services from authority bodies share of those who used the Internet for this purpose increased a bit less than 2 times, namely from 32.2% in 2014 to 64.3% in 2017. Alteration in the share of those using the Internet to get state services could be explained by overall increase of computer numbers and increase in amounts of computers with Internet access possessed by people. In addition the Russian Government implements programs aimed at digitalization of the state services sphere. In particular, the Internet portal Gosuslugi (State services) was opened and then regularly updated and widened with new functions, the same is for Internet portals of electronic government. This could also serve as a factor of increasing people's estimations of quality state and municipal services provided though Internet. Share of people using the Internet to get state services and fully satisfied with quality of these services increased from 57.5% in 2014 to 70.5% in 2017.
Among regions in 2017 the higher share of people's share used state services was in Yamalo-Nenets Autonomous Okrug (96.7%), Kurgan region (96%), Murmansk region (91.3%), Republic of Bashkortostan (90.6%), Republic of Tatarstan (90.2%). The lowest share was in Republic of Adygeya (27.2%), Republic of North Ossetia-Alania (33.4%), Oryol region (33.8%) and Magadan region (38.4%). Along with it distribution of regions in people's using state services differ from distribution in using the Internet for this purpose. So far among mentioned above regions high share of Internet use to get state services is only in Yamalo-Nenets Autonomous Okrug (86.1%) and Republic of Tatarstan (81.4%). At the same time leading position takes Moscow region (86.2%). The lowest share of people using the Internet to get state services in 2017 was in Chukotka Autonomous Region (19.2%), Jewish Autonomous Okrug (36.4%), Kostroma region (37%), Magadan region (37.8%) and Zabaykalsky Krai (37.8%).
Among those who used the Internet to get state services the most satisfied with their quality are inhabitants of Ryazan region (90.9%), Lipetsk region (89.9%), Tula region (89.1%), Karachayevo-Circassian Republic (88.9%), Yamalo-Nenets Autonomous Okrug (88%). For regions weakly involved in the Internet use to get state services the most significant reason seems to be dissatisfaction with quality of these services. These are Magadan region and Chukotka Autonomous Region, as they have lowest degree of satisfaction with quality –

22.5% and 24.4%, correspondently. Also low value of this indicators are in Zabaykalsky Krai (48.6%).
So far, sufficiently high level of using digital technologies for getting state services is still not reached in Russia (Rossija v zerkale mezhdunarodnyh rejtingov, 2019). Quality of these services is also under question as level of satisfaction with their quality was only in one region slightly higher than 90%.
***People informational activities safety.*** Gradual growth of people's share not facing problems in the sphere of information safety (from 66 to 71%) is observed in Russia during the analyzed period, and this growth occurred in Russia on the whole and in all federal districts, which says about reliability and sustainability of this trend. At the same time people's share using tools of information protection remains at nearly the same level in 2015-2017 (about 83-86%). Therefore we could conclude that along with growth of people's skills of using computers and the Internet, the understanding of what actions should be avoided in order not to face information safety problems is also growing, not relying only on tools of information protection (for example, on antivirus programs).

**Conclusions**
The article consider the indicators of digitalization of Russian economy and its influence on quality of digital aspect of life in the country. These indicators were combined into 6 blocks: digital competences of people, availability of digital goods, quality of working life and social sphere in conditions of digitalization, state electronic services for people and safety of people informational activities. 49 indicators covering almost all regions of Russia for the period of 2015-2017 were analyzed within these blocks. As a result of correlation analysis (calculation of paired correlation coefficients) 12 indicators were excluded from consideration.
Essential interpretation of the remaining 387 indicators points at:
- share of computer and Internet users with basic skills is going on in households, while share of "advanced" users remains stable;
- potential of growth of computer and Internet users in households remains in case of cheapening of getting new Internet connection, all before in rural and distant locations;
- on the whole saturation level in computers and information technologies (information networks, electronic document flow) using is achieved in Russian organizations. At the same time this level (approximately 1 computer per 2 workers) is lower than analogous indicator for households;
- educational institutions, which achieved saturation in computer number and Internet access, started to use newly got capabilities in development of distance education, online lectures etc. At the same time, in medical institutions as well as in institutions of culture the first stage of digitalization process (saturation with computers and Internet access) is still going on;
- high enough level of digital technologies using in providing state services for people has still not been achieved. Quality of these services is also under question as level of satisfaction with their quality was only in one region slightly higher than 90%;
- as a consequence of growing scale of using computers and the Internet, the skills of people in the field of information safety are also increasing, which shows itself in growing of people's share not facing problems in this area.

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