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DIGITAL COMPONENT OF PEOPLE'S QUALITY OF LIFE IN RUSSIA

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Abstract:

The term "people's quality of life" has not been given any widespread explanation in the context of society digital transformation. There are six attributes specified to characterize digital component of people's quality of life. Basing on official statistics data, subindices for the corresponding data blocks were computed. A mixed method to estimate the digital component of people's quality of life was used. Also, the Russian index of digital component of people's quality of life was defined for the whole country and for its federal districts. The results of computations allowed to characterize the changes in subindices within blocks and in the integral index covering eight federal districts and in Russia in the whole for the period of 2015–2017. Positive dynamics of the Russian index of digital component of people's quality of life was revealed with some fluctuations for different federal districts.

Key words: *Digital transformation, Index, Quality of life, Ranking, Federal districts of Russia*

1. 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.

People's quality of life is a multidimensional term and there is no shared vision on it. 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, pp. 15, 56).

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.

In modern conditions of augmented reality new approaches to measuring people's quality of life are necessary, which take into account its digital component.

2. Main characteristics of the digitalization of life and information base

To characterize people's quality of life in the real world from economic point of view different attributes were selected and unified into 5 blocks: people quality, people wealth, quality of working life, quality of social sphere, health and safety. Each attribute was characterized by a number of indicators (Quality of life in Russia and its regions, 2009). PQL estimation was made trough computation of indices for these blocks and then an integral PQL index was derived. In other research works summarized indices and special ratios, such as Gini ratio, R/P 10% ratio were used for estimation of quality and level of life (Bobkov, 2017).

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 literature and available information divided by regions showed that digital component of people's life could be characterized by the following attributes: digital quality of life, availability of digital goods for people, quality of working life in conditions of digitalization, social sphere and services in conditions of digitalization, state electronic services for people, safety of people informational activities.

State electronic services for people and organizations are significant part of modern life and are included in development programs in many countries (Melnikov, 2017).

The research covers 85 regions, 8 federal districts of the Russian Federation. Data on Arkhangelsk and Tyumen regions were used without taking into account data on the autonomous okrugs on their territories. Temporal period of the research is the years 2015 – 2017.

Initially 49 indicators reflecting 6 attributes of PQL were selected. After checking 37 indicators were left, 6 of them with negative connection to PQL (table 1)

Table 1. Quantity of indicators considered in subindices of people's life digitalization in Russia

Subindex	Selected for correlation analysis	Excluded as a result of correlation analysis	Remained	Of which having	
				Positive connection	Negative connection
1. Index of digital quality of people	11	3	8	5	3
2. Index of availability of digital goods for people	7	2	5	3	2
3. Index of quality of working life in conditions of digitalization	8	3	5	5	–
4. Index of social sphere and services in conditions of digitalization	17	4	13	13	–
5. Index of state electronic services for people quality	3	0	3	3	–
6. Index of people informational activities safety	3	0	3	2	1
Total	49	12	37	31	6

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.

The research used data from the Russian Federal State Statistics Service, National research university "Higher school of economics" and others (Digital Economy Indicators, 2017, Information Society, 2018, Russian Regions, 2018). 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 (Information Society, 2018, pp. 214–215).

Thereupon the integral Russian index of digital component of people's quality of life quality (DCPQL) with regional aspect was defined.

3. Research methods

The methods could be divided by the character of approach to PQL estimation into subjective, objective and mixed ones.

Subjective methods suggest defining to what extent needs of individuals in working, domestic and other spheres are satisfied. Subjective satisfaction in any life aspect reflects all before the level of correspondence between wishes and real situation. Describing and estimating indicators as well as estimation of immediacy of problems in one or another sphere of activities are suitable for subjective measuring of PQL. Indicators of subjective estimation could be presented by respondent opinions on to what extent some aspects of their living situation correspond to suggested standards. Level of correspondence is measured with some scale, for example, 1 is "completely satisfied", 5 is "completely un satisfied ". The tools used for subjective PQL measurement include not only questioning techniques but also a complex of computing procedures (Cherkashina, 2006).

Objective methods are based on use of statistical indicators or expert estimations, which are selected to characterize marked attributes (blocks) of PQL (for example 4 to 8). Each of the attributes reflects the conditions in which processes of satisfactions of both biological and social needs of society members arise. Utilization of these methods suggests computation of particular and integral indicators. An integral indicator of some synthetic category of PQL constitutes a special convolution of more particular attributes estimation and criteria of this term; it is aimed at making comparative analysis (temporal and spatial) of this category attributes. After that correlation and factor analysis is used as well as expert and statistical regression models, cluster analysis and other econometric methods (Ajvazjan, 2012).

Mixed methods use both statistical data and results of sociological surveys of, for example, households or some groups of population as PQL indicators. In our days they are widely used to form different national and regional indices and estimations. In our research a mixed method of digital component of PQL estimation is used which is stipulated by the character of information used.

The method of construction of a Russian index of digital component of people's life includes several stages.

On the first stage indicators characterizing 6 blocks of people's life digitalization for maximum number of years were selected. Then analysis of correlation relationship between these indicators was made and the indicators showing high correlation ratios were excluded. The exclusion of indicators was made if correlation ratio was equal or more than 0.7.

On the second stage the procedure of minimax normalization was applied. Normalized values of indicators were defined for each region ($r = 1,\ldots,R$) and for each year

of analyzed period of time ($t = 1,\ldots,T$). Minimum and maximum values of a given indicator were taken from all regions in the given year. Normalization was done for two different groups of indicators depending on their negative or positive influence on the obtained result:

– for indicators with positive influence:

$$X_{iM}^{r} = \frac{(x_i^r - X_i^{\min})}{(X_i^{\max} - X_i^{\min})},$$

– for indicators with negative influence:

$$X_{iM}^{r} = \frac{(X_i^{\max} - x_i^r)}{(X_i^{\max} - X_i^{\min})},$$

where X_{iM}^{r} is normalized value of indicator *i* for region *r*;

x_i^r is value of indicator *i* for region *r*;

$X_i^{\max}$ is maximum value of indicator *i*;

$X_i^{\min}$ is minimum value of indicator *i*.

On the third stage the values of subindices, aggregated indices by regions and years of analysed period were defined as arithmetic mean of normalized values of respective aggregation of indicators. Many methods suggest an equal significance of each indicator in subindices convolution (The Ranking of Innovative Development, 2017, Russia in the Mirror of International Ratings, 2019).

After that values of regional indices and subindices according to PQL blocks were defined:

$$I_r^b = \frac{1}{nb} \cdot \sum_{i=1}^{nb} X_{iM}^{rb},$$

where *nb* is number of normalized indicators for computation of index or subindex according to PQL blocks, *b* is an index of PQL block, $b \in [1; B]$;

B is the total number of blocks characterizing digital component of people's life.

The value of Russian IPDQL (Index of people's digital quality of life) was defined as weighted average of subindices values. Weight ratios values were taken equal to share of indicator amounts used for computation of each subindex, for all selected indicators. The sum of weight ratios is equal to one. Therefore the Russian IPDQL (RI_r) for each year from the analyzed period is:

$$RI_r = \sum_{b=1}^{B} \left(\frac{nb}{N} \cdot I_r^b\right),$$

where *N* is the total amount of normalized indicators selected for computation of the Russian index of people's digital quality of life.

The obtained values of indices and subindices were compared between themselves for each year.

On the third stage of the method application regions were ranked in the descending order of DPQL index and subindices and the regions were assigned with rankings (places) for different years of the analyzed period. After this we searched for changes in rankings of subindices and in the Russian index of people's life digitalization, and then formulated comprehensive conclusions.

4. People's digital quality of life in the Russian federal districts in 2015–2017

Index PDQL in the Russian Federation showed growth during the years 2015–2017. In 2016 its value increased from 0.488 to 0.525 (see the table 2). The year 2017 was not so fruitful, as the index growth turned to be on negligible level, so its value reached 0.528. In addition while in 2016 the index PDQL grew in all federal districts, in 2017 positive growth rates kept only two of them – Siberian and Volga federal districts. In the Southern federal district index value remained on the same level as in 2016. In the North-Western, Central, Ural, Far Eastern and North Caucasian federal districts showed decrease of the Index.

Table 2. Values of PDQL index for federal districts in 2015–2017 and their rankings

Federal district	Values of PDQL index for federal districts			Rankings of federal districts		
	2015	2016	2017	2015	2016	2017
Russian Federation	0.488	0.525	0.528	-	-	-
North-Western federal district	0.539	0.572	0,564	1	1	1
Central federal district	0,516	0,564	0,560	3	2	2
Ural federal district	0,523	0,559	0,555	2	3	3
Volga federal district	0,488	0,512	0,525	4	4	4
Siberian federal district	0,477	0,493	0,500	5	6	5
Far Eastern federal district	0,469	0,510	0,497	6	5	6

In the North-Western federal district PDQL index grew by 6.2% in 2016, and then it decreased by 1.4% in 2017. The factors contributing to growth in 2016 were significant increase of 4 subindices – Index of digital quality of people (6.4%), Index of availability of digital goods for people (5.1%), Index of social sphere and services in conditions of digitalization (10.1%) and Index of people informational activities safety (7.9%). At the same time in 2017 a notable increase was demonstrated only by Index of

state electronic services for people quality (7.5%) whereas Index of availability of digital goods for people showed significant decrease (–9.5%), which could be explained by decrease in share of households using personal computers and share of households having broadband Internet access. The growth rates of other subindices were weakly positive or weakly negative. During the whole analyzed period the North-Western federal district was keeping its first ranking, which is in good accordance, among other things, with results of analysis of people's money income and obtained conclusions on leading positions of the rich with resources and raw-materials regions (Litvintseva, 2014.).

In the Central federal district the dynamics of PDQL index is quite similar. After growing by 9.4% in 2016 it stagnated in 2017, decreasing by 0.7%. The growth in 2016 could be explained by high growth rates of Index of digital quality of people (9.1%), Index of availability of digital goods for people (18.1%) and Index of social sphere and services in conditions of digitalization (17.0%). Very significant growth rates of the latter two subindices are caused by increase of households using personal having broadband Internet access as well as increase of computers amount in educational institutions and number of implemented distant educational programs. In 2017 notable growth was shown by Index of quality of working life in conditions of digitalization (7.7%) and Index of state electronic services for people quality (14.2%), which was however compensated by decrease of Index of digital quality of people (–4.4%) and Index of availability of digital goods for people (–9.3%). In total such a dynamics allowed to increase ranking of the Central federal district from 3 to 2 among other federal districts (see Fig. 1)

The Ural federal district also showed significant increase of PDQL index in 2016 – by 7.0% which was followed by a slight decrease by 0.7% in 2017. For this district the increase in 2016 could be caused by high growth rates of Index of digital quality of people (14.9%), Index of availability of digital goods for people (26.9%) and Index of state electronic services for people quality (15.7%), which seems to be connected with increase of households using personal having broadband Internet access as well as increase of share of people using Internet to get access to state and municipal services. In the same time Index of people informational activities safety showed notable decrease. Despite positive changes the ranking of the Ural federal district diminished from 3 to 2, letting the Central federal district to pass ahead. In 2017 a significant decrease happened to Index of availability of digital goods for people (–9.6%), changes in other subindices values were mostly weakly positive, which resulted in overall weakly negative dynamics for the whole district.

In general following the common dynamics PDQL index increased in 2016 comparing to 2015 in the Volga, Southern, North Caucasus, Siberian and Far Eastern federal districts. Its further dynamics is not so homogenous. In 2017 Volga and Siberian federal districts continued to grow. In the same time index value of the Far Eastern federal district decreased in 2017 after significant increase in 2016, which made its ranking lower than that of the Siberian one (Fig. 1). In the whole the Siberian and Far Eastern federal districts could be grouped with the Volga federal district in relation to dynamics of their indices (table 2).

Two districts in the South of Russia form a group with the lowest values of PDQL index. While rest six districts have values of indices quite close to its whole value for

Russia, Southern and North Caucasian districts values are notable lower than all-Russian index. It its especially true for the North Caucasian federal district. So far with all-Russian index value being equal to 0.528 in 2017, it was only 0.472 for the Southern federal district and 0.380 for the North Caucasian one (table 2). In addition growth of both indices in 2016 changed to stagnation in the Southern federal district and to decrease in the North Caucasian. Despite this index value of the Southern federal district is quite close to those of the Volga, Siberian and Far Eastern districts allowing to include them in a single group.

The Volga federal district is one of a few which demonstrated quite high growth rates of PDQL index during the whole analyzed period. Its growth in 2016 comparing to 2015 was 4.9% while in 2017 its value was 2.5%. However the factors of this growth were different in 2016 and 2017, so this growth could not be characterized as sustainable. In 2016 the main reason of the index growth was increase of Index of digital quality of people and Index of availability of digital goods for people, all before it is due to share of households using personal computers and share of households having broadband Internet access. The level of people skills of using personal computers also notably increased. In 2017 the prevailing influence was from growing Index of social sphere and services in conditions of digitalization and Index of state electronic services for people quality, all before due to digitalization if libraries and museum funds as well as growth of people share using Internet to get access to state and municipal services. As a result, the district kept its fourth place among other federal districts.

Analysis of PDQL index shows that **the North Caucasian federal district** has the lowest ranking during the given period of time. After it grew by 6.4% in 2016, in 2017 it stagnated with decrease by 0.6%. Growth in year 2016 is connected with increase of Index of digital quality of people (10%), Index of availability of digital goods for people (5.9%) and Index of state electronic services for people quality (33.7%). The weakest digitalization development level has quality of social sphere and services, though dynamics is positive here just as for Index of state electronic services for people quality and Index of people informational activities safety. Other three subindices showed decrease which caused overall diminishing of PDQL index for the given district in 2017.

In the Southern federal district subindices dynamics shows similar trends besides Index of quality of working life in conditions of digitalization, which was significantly increasing during the whole observation period (by 16.7% in 2016 and by 10.2% in 2017). Meanwhile growth of four subindices in 2017 is partially compensated by decrease of two rest ones, namely Index of digital quality of people (–3.7%) and Index of availability of digital goods for people (–12.1%). On the whole such a dynamics results in the absence of notable changes of PDQL index in 2017, and like the North Caucasian federal district, the Southern one did not change its 7th ranking in PDQL index value among other regions (Fig. 1).

The Siberian federal district is the second district in Russia with positive dynamics of PDQL index during the whole period of 2015–2017. The growth was 3.2% in 2016 and 1.5% in 2017. In 2016 it was connected to substantial increase of Index of digital quality of people (10.7%), Index of availability of digital goods for people (16.2%) and Index of people informational activities safetys (6.5%). Slower growth of PDQL index in 2017 could be explained by decrease of Index of digital quality of people (–0.3%), Index of availability

of digital goods for people (–8.4%) and Index of quality of working life in conditions of digitalization (–0.9%). The rest of subindices showed positive growth rates. This situation resulted in keeping by the Siberian federal district its ranking in 2017 at the same level as in 2015, despite temporary decrease in 2016.

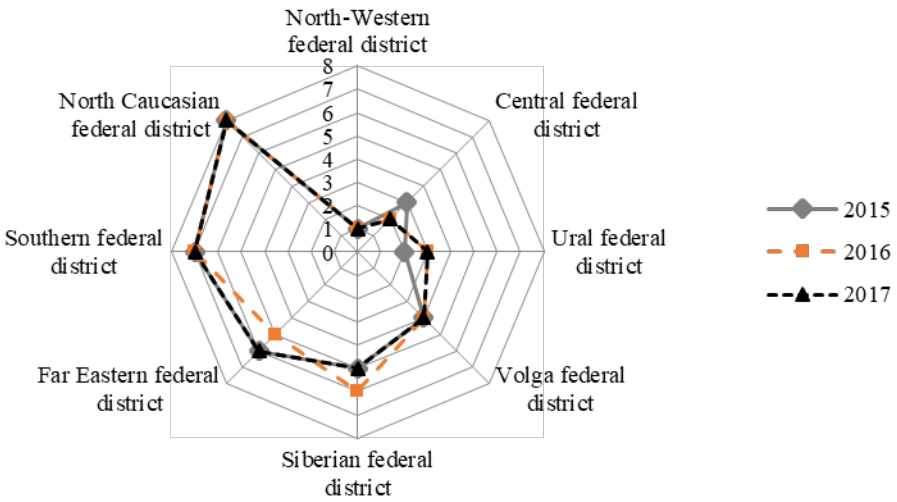

Fig. 1. Rankings of the federal districts of Russia by PDQL index in 2015–2017

Distinctive feature of the **Far Eastern federal district** is substantial decrease of PDQL index in 2017 by 2.5%. It happened due to decrease of three subindices, namely Index of digital quality of people (–7.9%), Index of availability of digital goods for people (–7.6%), Index of social sphere and services in conditions of digitalization (–1.9%), which showed significant increase in 2016 (11,1%, 20,4%, 9,4%, respectively), which allowed the Far Eastern federal district get a higher 5th ranking in 2016, surpassing the Siberian federal district. However in 2017 the district again became 6th in ranking, as in 2015.

5. Activation of economic policy in the field of digital economy

In 2017 the program "Digital economy" till the year 2024 was established in Russia. Its purpose is to implement digital technologies in all areas of social life, i.e. in economy, state management, municipal facilities, social sphere etc. The five main directions of the program are regulatory regime, work force and education, formation of research competences and technical advance, information facilities and safety, they are connected to the four components of people's life digitalization. Another three applied directions are state management, "smart city" and medicine, they cover two of components of people's life digitalization, namely social sphere and state electronic services. For example, share of people who raised their level of skills in the field of information safety, media consumption and Internet-services use is planned to rise 5 times to 50% during 7 years [Government Program “Digital Economy of the Russian Federation”, 2017].

At the present time programs of digital economy development are under elaboration in the regions of the Russian Federation, they would concern different aspects of people's life. An example could be the program "Smart city – 2030", which sets up goals and tasks of digital technologies development in Moscow till 2030. Share of the capital region in Russian GDP is about 26%. Upon the year 2017 Moscow entered the TOP-50 innovative cities of the world in the ranking "Innovation Cities Index" composed by the agency "2thinknow", taking 17th place among European cities. The main goals of the program are rise of quality of life, transparent city management and effectiveness of government spending. It is planned to achieve not less than 5% growth rates of Moscow gross regional product by means of digital technologies use (Development Directions of Smart City of Moscow, 2019). Implementation of the program would allow to raise the Index of digital component of people's quality of life of the Moscow city as administrative center of the Central federal district and the capital of Russia.

6. Conclusions

In 2015–2017 the growth of digital component of people's quality of life is observed in Russia. In 2016 index PDQL grew by 7.5%, however in 2017 the growth was only 0.6%. It is connected with growth of digitalization parameters in all federal districts in 2016 and non-uniform changes in 2017. Also the federal districts could be divided into three groups. The first one includes districts with the Index values higher than the Russian average, for example higher than 0.528 in 2017, this group consists of the North Western, Central and Ural districts. The second group consists of federal districts with the Index value lower than the Russian average but close to it, the Volga, Siberian, Far Eastern and Southern districts belong to this group. The third group is for districts with the lowest values of the PDQL Index, which are significantly below the Russian average, it includes the single North Caucasian federal district.

Russian federal districts showed only a few changes in their rankings of PDQL index. In 2017 only the Central federal district improved its ranking by one position outranging the Ural federal district. In 2016 the Far Eastern federal district increased its ranking getting higher than the Siberian on, but in 2017 these two districts returned to their initial places. Changes of various directions occurred on the regional level within federal districts, they require further study.

In all regions the most significant growth occurred in the field of Index of state electronic services for people quality, which could be explained by implementation of respective government development programs. The most significant contribution into the growth of this subindex was made by indicator reflecting the people's estimation of quality of state and municipal services provided through Internet in the Russian regions. This indicator value shows the share of respondents completely satisfied with quality of state services provided through Internet.

The results of this research could be used for scientific substantiation of digital economy development programs elaborated on the regional level.

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