Tatiana P. Skufina[1], **Sergey V. Baranov**[2], **Vera P. Samarina**[3]

DEPENDENCY BETWEEN ECONOMIC DEVELOPMENT OF RUSSIAN REGIONS AND THEIR LEVEL OF INFORMATIZATION [*]

The article is dedicated to considering the processes of informatization in the regional space of Russia. We try to explain the quantitative dependencies found between the processes of informatization and economic characteristics of Russian regions. Based on the calculation results the authors define the perspectives for further research of the informatization processes in the regions of Russian Federation and its actuality.

Keywords: *informatization; economic development; Russian regions; interregional differentiation.*

Тетяна П. Скуфьїна, Сергій М. Баранов, Віра П. Самаріна

ЗАЛЕЖНІСТЬ МІЖ ЕКОНОМІЧНИМ РОЗВИТКОМ РЕГІОНІВ РОСІЇ ТА РІВНЕМ ЇХ ІНФОРМАТИЗАЦІЇ

У статті досліджено процеси інформатизації регіонального простору Російської Федерації. Зроблено спробу пояснити кількісну залежність між процесами інформатизації та економічними показниками регіонів РФ. Авторські розрахунки дозволили обгрунтувати перспективи та актуальність досліджень щодо кореляції між процесами інформатизації та економічним розвитком.

Ключові слова: *інформатизація; економічний розвиток; регіони Росії; міжрегіональна диференціація.*

Табл. 2. Літ. 26.

Татьяна П. Скуфьина, Сергей М. Баранов, Вера П. Самарина

ЗАВИСИМОСТЬ МЕЖДУ ЭКОНОМИЧЕСКИМ РАЗВИТИЕМ РЕГИОНОВ РОССИИ И УРОВНЕМ ИХ ИНФОРМАТИЗАЦИИ

В статье исследованы процессы информатизации регионального пространства Российской Федерации. Сделана попытка объяснить количественную зависимость между процессами информатизации и экономическими показателями регионов РФ. Авторские расчёты позволили обосновать перспективы и актуальность исследований о корреляции между процессами информатизации и экономическим развитием.

Ключевые слова: *информатизация; экономическое развитие; регионы России; межрегиональная дифференциация.*

Problem setting. Russian governance is facing the fundamental problem – contradiction between the task of forming an innovative model of the economy and its actual extracting type. This contradiction leads to theoretical and practical actuality of the research aimed at solving the issues of innovative development, taking into account the specifics of Russian economy. One of such specific tasks is to review the processes of informatization. However, with regards to Russia there is one more problem – regional space is extremely diverse in terms of economic development and economic specialization. Therefore, in studying the notion of informatization we have to take into the account this regional diversity.

[1] Institute of Economic Problems of the Kola Science Centre of the Russian Academy of Sciences, Apatity, Russia.
[2] Institute of Economic Problems of the Kola Science Centre of the Russian Academy of Sciences, Apatity, Russia.
[3] Voronezh Economic-Law Institute, branch in Stary Oskol, Russia.

[*] Publication was prepared within the framework of projects supported by the Russian Scientific Humanitarian Foundation, Grants No. 14-02-00128, No. 15-02-00127.

Literature review. Research on the specifics of informatization and its influence on economy and social development is one of the basic directions in the world science. Explanation for this increased attention is obvious – vast resources involved in the processes of informatzation gave rise to the new principles and bases of social development – information society, and its derivative – information economy. Let us leave aside the multidimensional consideration of information society, as considered in a variety of other scientific works (Baranov and Samarina, 2015; Kluver, 2004; Yi and Wei, 2012). We would like to narrow the range of consideration and focus on the studies that directly connect informatization and economic development. In this aspect the global research covers 3 main directions.

The first direction is the assessment of the impact that informatization has on productivity of countries, regions, and sectors (Baranov and Skufina, 2007; Cardona, Kretschmer and Strobel, 2013; Cortes and Navarro, 2011; Evans and Kim, 2014; Sun et al., 2014; Walsham, 2010).

The second direction is identification of factors that contribute to (or hindering) informatization (Brynjolfsson and Saunders, 2010; Gouvea and Kassicieh, 2012; Gulmamedov, 2012; Gust and Marquez, 2004; Skufina and Baranov, 2004).

The third direction is defining and focusing on those areas, where government and (or) private businesses can achive the best results in further development of informatization and its economic effects (Economist Intelligence Unit, 2004; Majumdar et al., 2010; Rao and Krishna, 2013; Swift, 2014; Syverson, 2011).

Generalization of the results of these studies suggests that it is the level of informatization that defines the pace of economic growth, labor productivity, social characteristics, as well as population's life quality. Therefore, the results of these studies reflect the formation of economic and social policies, as well as practical steps of government regulations in developed countries. For example, in 2000 the EU leaders adopted a plan of economic reforms, which aims to transform the EU into the most dynamic and competitive information economy in the world. Significance of this document is defined by one of the main problems of Europe – being behind the USA in labor productivity and pace of its growth (Gust and Marquez, 2004; Majumdar and Carare, 2010; Khalili, 2014; Van Ark et al., 2008). Setting such a priority for economic development is still too early for the Russian Federation (Samarina et al., 2015). Thus, the main attention of Russian researchers is directed on catching up development in the area of information and technological modernization of economic and social sectors (Baranov and Skufina, 2007; ComNews Research, 2014), including the issues of creating a civilized institutional environment (Skufina and Baranov, 2004). Similar issues are also reflected in legal documents dedicated to the issues of informatization, for example, in the Government Program of Russian Federation "Information society (2011–2020)" (2010).

Problem statement and research objective. Specificity of this research is manifested in two aspects. The first one is connected with the formulation of the research problem – goals and results are directed at the diagnostics of informatization development taking into account a number of serious shortcomings in Russian economy including the problem of interregional differentiation of socioeconomic development. The second aspect is determined by the research methodology, which offers primary quantitative description of the processes of informatization in relation to

economic development of Russian Federation regions. Firstly, this allows statistically determine the relationship between economic development and informatization of Russian regions. Secondly, quantitatively estimate the specifics and comparable dynamics of informatization in Russian regions. Thirdly, diagnostics of the situation using the formalized methods eliminates the subjectivity in the estimates. This aspect is important in case of using the results of this diagnostics for the purpose of managing the informatization processes in a regional space.

The goal of this research is the study and explanation of quantitative dependencies between informatization processes and economic characteristics of the regions in the Russian Federation.

The objectives of the study are aimed at finding the answers to the following questions. Is there a dependency between the results of functioning economy of the regions of Russian Federation and informatization development? Are these any universal informatization tendencies in Russian regions? Can we see the specifics of informatization by regions of Russian Federation that are differentiated into three groups based on the level of socioeconomic development and the degree of involvement in global processes (regions – engines of growth; supporting regions; depressed regions)?

Key results. At the first stage of the study we determine the relationship between economic results of regional economy and cost associated with informatization. The basic indicator of how the economy performs in a region is its per capita Gross Regional Product (GRP). The basic indicator for informatization cost is expenditures on information and communication technologies (ICT) in a region.

To find the relationship between economic indicators and costs associated with developing informatization of regions we originally defined by the presence (absence) of a connection between the basic economic indicators – per capita GRP and investments in fixed capital. It is obvious that if such a dependence is absent, then there is no point in looking for the relationship between per capita GRP and expenditures made on ICT in a region. However, the study reveals that there exists high probability of dependence (Table 1). Thus, the coefficient of correlation during the studied period (2003–2013) is ranged between 0.81 and 0.99. Moreover, over the last 5 years we saw the most intense tightness in the linear dependency between these indicators.

However, the question arises whether there is a relationship between investments into fixed capital of Russian regions and expenditures on ICT? Just as in the previous case, it is obvious that if such a dependence is absent, then it would be meaningless to search for a quantitative relationship between economic results of the regions and their expenditures on ICT. This statement is based on the fact that the absence of such a relationship shows that ICT cost is negligibly small as an investment. Therefore, it is not possible to "find" them in the economic results of region's functionality.

However, we calculated that during the period between 2003 and 2013 a significant correlation was tracked (fluctuations in the range between 0.34 and 0.72) between investments in fixed capital and expenditures on ICT in the regions of the Russian Federation. It is notable, that the degree of closeness of linear dependence is expected to be lower than between per capita GRP and investments in fixed capital. Our calculation results demonstrate that the dependence is significantly higher between per capita GRP and ICT expenditures – fluctuations in the correlation coefficient is between 0.55 and 0.89 (Table 1).

Table 1. **Dependence between economic indicators and ICT expenditures in the regions of the Russian Federation** (Russian Statistics Committee, 2014)

Indicators	Values of the correlation coefficient										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Per capita GRP – investments in fixed capital	0.92	0.94	0.89	0.82	0.81	0.83	0.99	0.98	0.95	0.98	0.99
Investments in fixed capital – expenditures on ITC	0.45	0.63	0.34	0.42	0.56	0.44	0.62	0.53	0.72	0.54	0.56
Per capita GDP – expenditures on ICT	0.55	0.76	0.63	0.76	0.86	0.72	0.73	0.69	0.82	0.72	0.80
Per capita GRP – the share of expenditures on ICT	-0.06	-0.22	-0.10	-0.17	-0.16	-0.06	-0.10	0.01	-0.01	-0.09	-0.10

Most likely, the link between investments in fixed capital and expenditures on ICT is of "secondary" character, which is defined by a relationship between per capita GRP and investments in fixed capital. That is, given the exploiting nature of the majority of the regions the non-high technological character of the economy is obvious, as the share of costs on ICT in the investments into fixed capital is low. This confirms the reverse relationship between GRP per capita and the share of expenditures on ICT (Table 1).

Thus, we can make a preliminary conclusion: it is not the investments in fixed capital that define expenditures on ICT, but the value of GRP per capita, that is, the ability of regions to spend their resources on informatization of their regional space.

In the process of identifying the relationship between the results of regional economy functioning and the level of their informatization the following problem arises. The regions of the Russian Federation are extremely diverse in their economic specialization, characterized by significant interregional differentiation in terms of socioeconomic development.

It is expected that the character of the dependence between the economic characteristics of the regions and informatization of regional space will also differ. Studies of this kind, in addition to analytical goal of identifying the specifics of spacial development of informatization, are also focused on administrative tasks. Thus, these studies suggest the formulation of recommendations concerning informatization factors contributing to economic and social development of Russian regions. These recoomendations must take into account the specifics of each region. As of the end of 2015 the number of regions in Russian Federation was 85 subjects. This significant number of regions makes the diagnostics of the situation a very complicated task. Consequently, it is difficult to develop general and specific recommendations for managing regional development. Therefore, it is necessary to differentiate various regions of the Russian Federation according to certain criteria of their development.

As a result of reviewing and summarizing the main typologies of socioeconomic development of Russian regions it is feasible to use the official typologies of the sub-

jects of Russian Federation, published by the Ministry of Regional Development on 22.01.2007 (hereafter – Typology) (Ministry of Regional Development, 2007).

We suppose that usefulness of using a particular typology is defined by 4 arguments. First argument – the typology was developed based on legal documents used in regional policy and practice of territorial administration. The second argument – the typology is officially adopted for use, thus, it fully reflects the goals and the objectives of territorial development governance. The third argument – in this typology all the regions are grouped by the level of development, which is fully consistent with the goals of the present study. Forth argument – regions of Russian Federation are included into the same type when they have common tendencies of socioeconomic development and are characterized by similar characteristics.

In this study we explore the 3 types of regions.

1. Regions – the engines of growth (subtypes: global cities and centers of federal significance). They are characterized by the highest rates of per capita GRP, the volume of investments in fixed capital, financial security, involvement in foreign economic relations, relatively high purchasing power and lower share of the poor as compared to the Russian average.

According to the Typology such regions are: Moscow, St. Petersburg, Krasnodar Krai, Krasnoyarsk Krai, Leningrad region, Moscow region, Perm region, Republic of Bashkortostan, Tatarstan, and Sverdlovsk region.

2. Supporting regions (sub-types: raw and old industrial regions). In most of these regions infrastructure projects are aimed at providing transit economy, highly organized urban life is absent. Old industrial regions are characterized by traditional industrial production, which is experiencing a structural crisis (outdated technological base, low living standards, lack of qualified personnel etc.).

According to the Typology to the raw sub-type belong the following regions: Kemerovo region, Nenets Autonomous District, Komi Republic, the Republic of Sakha (Yakutia), Sakhalin region, Taimyr (Dolgan-Nenets) Autonomous District, Tyumen region, the Khanty-Mansi Autonomous District, Yamalo-Nenets Autonomous District.

According to the Typology, to the old industrial regions sub-type belong the following regions: Belgorod region, Volgograd region, Vologda region, Irkutsk region, Lipetsk region, Niznyi Novgorod region, Novosibirsk region, Omsk region, Primorsky Krai, Rostov region, Samara region, Tomsk region, Khabarovsk, Chelyabinsk region, and Yaroslavl region.

3. Depressed regions (sub-type: background and crisis). These have lower than the national average economic indicators, in the past they used to be developed regions, by some economic indicators they were #1 in the country. They are characterized by low living standards, and deficit of labor resources. According to the Typology the background regions are: Altai Krai, Amur region, Arkhangelsk region, Astrakhan region, Vladimir region, Voronezh region, the Jewish Autonomous region, Kaliningrad region, Kaluga region, Kirov region, Kostroma region, Kursk region, Murmansk region, Novgorod region, Orenburg region, Orel region, Penza region, Pskov region, Republic of Buryatia, Republic of Mari El, Mordovia, Ryazan region, Saratov region, Smolensk region , Stavropol, Tambov region, Tver region, Tula region, Udmurtia, Chita region, Chuvash Republic, Chukotka Autonomous district.

According to the Typology the crisis regions are: Agin-Buryat Autonomous District, Bryansk region, Ivanovo region, Kabardino-Balkar Republic, Kamchatka region, Karachayevo-Cherkess Republic, Koryak Autonomous district, Kurgan region, Magadan region, Republic of Adygea, Altai Republic, Dagestan Republic, Republic of Kalmykia, Republic of Karelia, Republic of North Ossetia-Alania, Republic of Tyva, Khakassia, Ulyanovsk region, Ust-Orda Buryat Autonomous Okrug, and Evenki Autonomous district.

Typology also highlightes the type of "special regions" (special territories), which are characterized by complex political situation (only two subjects – Republic of Ingushetia and Chechen Republic). However, this type is of a non-systematic nature that is why it is excluded from further consideration.

The share of expenditures on ICT in the investments in fixed capital according to the Typology of the regions is presented in Table 2. Consideration of the nationwide situation indicates that the share of expenditures on ICT during the studied period (2003–2013) is relatively small – it varies between 3.8–6.3%.

This is quite a stable tendency with expenditures on ICT share to be dropping in the investments in fixed capital until 2008, but during the crises this share is slightly increasing. Also, this trend is the same for engines, supporting, and depressed regions.

From the management perspective this tendency should be considered as mostly positive, because it is directed on infrastructural improvements of the "new economy" of socioeconomic space of all types of regions in Russian Federation. During the crises periods it is optimal to invest exactly in infrastructural improvement. The logic behind this is simple – it is not only creating jobs, but also investments in future, that is, once a crises is over infrastructure and a certain level of ICT development will remain. The negative element is that ICT expenditures initiate an income stream in other, highly technological countries instead of alternative injections into the industries of the own national economy. However, this is a typical situation because such losses are usual for the extracting type of economies. Search for alternatives in the development is not included in the present study but some applications cover that problem partly through the research. In particular, the authors previously suggested developing alternative software by domestic means (Skufina and Baranov, 2004) as it is reflected in the documents regulating the process of informatization in Russian Federation (The state program of the Russian Federation "Information Society (2011–2020)", 2010).

In the regions – engines of growth the average share of expenditures on ICT in the investments in fixed capital is expectedly higher than in other subjects (Table 2). This can be explained by two main factors. First, higher scientific and technological development as compared to other subjects of the Russian Federation need higher investments in ICT. Secondly, orientation of the current public policy is on the natural development of informatization in these regions. The reason for weak demand for informatization technology in old industrial regions is different – tradition industrial production is experiencing systematic crisis and thus is not able to initiate stable demand. The question arises: why such different groups of regions are demonstrating very similar trends of informatization? In our opinion there are two reasons for that. The first reason is that significant attention and vast resources of the government are

directed in developing informatization only regionally. The second reason is directly related to the first one – there is a universal tendency of continuous improvement of necessary minimum level of informatization in all regions. These reasons explain the similarity in expenditures on informatization in supporting and depressed groups of Russian regions.

Table 2. **The average share of ICT expenditures in the investments in fixed capital by the types of regions** (Russian Statistics Committee, 2014)

Grouped of regions by types	%										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
All of the regions in RF	6.3	5.6	6.2	4.6	3.9	3.8	4.3	5.6	5.2	5.4	5.1
Regions – engines of growth	8.0	7.7	5.3	5.3	5.0	4.3	6.1	7.5	7.6	7.4	6.9
Supporting regions	7.0	4.5	5.4	5.2	3.6	3.3	4.0	5.0	4.8	5.1	5.2
Depressed regions	5.8	5.8	6.9	4.5	4.0	4.1	4.3	5.5	5.3	4.9	5.3

Conclusions and directions for further investigation. We would like to highlight two main conclusions.

First, *there is a significant correlation between economic development of the regions in Russia and the level of informatization.*

Secondly, *there is a reason to believe that in the regions of the Russian Federation not informatization defines economic results, but on the opposite – economic results determine the opportunities to spend region's resources on informatization.*

The first conclusion allows proposing a hypothesis based on unevenness in economic development of Russian regions – regional space of the Russian Federation is characterized by significant differentiation in informatization level. This regional diversity of informatization space leads to the formulation of fundamental contradiction – contradictions between the mining type of economy in Russia that requires provision of certain socioeconomic equality of regions, particularly in terms of the level of informatization, and the objectives of economic efficiency that suggests the dependence of social characteristics of the regions (including the level of informatization) upon the economic results of these regions functioning. This contradiction supports the relevance of more indepth research in the field of information of regional space of the Russian Federation.

The second conclusion also allows identifying specific targets for further research. For example, to determine whether or not informatization influences economic development of the regions in Russia? If affected, then what is the quantitative correlation between the level of informatization of regions and economic results? Posing such questions naturally leads to the problem of forming an according economic tool for research that would be adequate to the tasks and the statistical base. Thus, further study of the informatization phenomenon within regional space will allow expanding the theoretical understanding of the specifics of this phenomenon development and improving the methodological tools for econometric modelling of regional processes.

References:

О государственной программе Российской Федерации «Информационное общество (2011– 2020 годы)»: Распоряжение Правительства Российской Федерации от 20.10.2010 № 1815-р // Собрание законодательства РФ.– 15.11.2010.– №46.– Ст. 6026.

O gosudarstvennoi programme Rossiiskoi Federatcii «Informatcionnoe obshchestvo (2011– 2020 gody)»: Rasporiazhenie Pravitelstva Rossiiskoi Federatcii ot 20.10.2010 № 1815-r // Sobranie zakonodatelstva RF.– 15.11.2010.– №46.– St. 6026.

Баранов С.В., Самарина В.П. Системная динамика информационно-коммуникационного пространства и социально-экономическое развитие Северо-Арктических территорий: отображение проблемы в научных исследованиях // Современные проблемы науки и образования.– 2015.– №2 = DOI: 10.17513/spno.122-21083.

Baranov S.V., Samarina V.P. Sistemnaia dinamika informatcionno-kommunikatcionnogo prostranstva i sotcialno-ekonomicheskoe razvitie Severo-Arkticheskikh territorii: otobrazhenie problemy v nauchnykh issledovaniiakh // Sovremennye problemy nauki i obrazovaniia.– 2015.– №2 = DOI: 10.17513/spno.122-21083.

Регионы России. Социально-экономические показатели – 2014 г. // Официальный Интернет-портал Росстата // www.gks.ru.

Regiony Rossii. Sotcialno-ekonomicheskie pokazateli – 2014 g. // Ofitcialnyi Internet-portal Rosstata // www.gks.ru.

Скуфьина Т., Баранов С. К вопросу о высоких технологиях, издержках легализации и способах их уменьшения // Вопросы экономики.– 2004.– №2. – С. 82–95.

Skufina T., Baranov S. K voprosu o vysokikh tekhnologiiakh, izderzhkakh legalizatcii i sposobakh ikh umensheniia // Voprosy ekonomiki.– 2004.– №2. – S. 82–95.

Типология социально-экономического развития субъектов Российской Федерации // Министерство регионального развития РФ // archive.minregion.ru.

Tipologiia sotcialno-ekonomicheskogo razvitiia subektov Rossiiskoi Federatcii // Ministerstvo regionalnogo razvitiia RF // archive.minregion.ru.

Baranov, S., Skufina, T. (2007). Analysis of informatization of Murmansk region economy and estimating of legalization costs of typical software. In: Applied Information Technology Research – Articles by Coopertive Science Network (pp. 60–66). University of Lapland, Department of Research Methodology Reports, Essay and Working Papers. Lapin Yliopistopaino, Rovaniemi.

Brynjolfsson, E., Saunders, A. (2010). Wired for Innovation. The MIT Press.

Cardona, M., Kretschmer, T., Strobel, T. (2013). ICT and productivity: conclusions from the empirical literature. Information Economics and Policy, 25(3): 109–125.

ComNews Research (2014). The cost of cellular cervices in the regions of Russia (2014) main results of the study // www.comnews-research.ru.

Cortes, E.A., Navarro, J.L.A. (2011). Do ICT influence economic growth and human development in European union countries? International Advances in Economic Research, 17(1): 28–44.

Economist Intelligence Unit (2004). Realization of the benefits of ICT and economic growth in Europe. Economist Intelligence Unit on request by Microsoft. Newsletter. In: Information Society, 5: 57–72.

Evans, P., Kim, J.U. (2014). The spatial dynamics of growth and convergence in Korean regional incomes. Applied Economics Letters, 16: 1139–1143.

Gouvea, R., Kassicieh, S. (2012). Bridging the innovation divide: the Brazilian experience. Thunderbird International Business Review, 54(3): 275–289.

Gulmamedov, R. (2012). Cognitive map for the analysis of problems of the regional informatization. Business Informatics, 2(20): 65–70.

Gust, C., Marquez, J. (2004). International comparisons of productivity growth: the role of information technology and regulatory practices. Labour economics, 11(1): 33–58.

Khalili, F. (2014). The contribution of information communication technology (ICT) to total factor productivity (TFP) and economic growth: Evidence from Asia-Pacific and EU countries. University of Malaya. 214 p.

Kluver, R. (2004). Globalization, informatization, and intercultural communication. Intercultural communication: A global reader, Vol. 5. 425 p.

Majumdar, S., Carare, O., Chang, H. (2010). Broadband adoption and firm productivity: evaluating the benefits of general purpose technology. Industrial and Corporate Change, 19(3): 641–674.

Rao, M.N., Krishna, S.R. (2013). Efficient and Ubiquitous Software Architecture of e-Governance for Indian Administrative Services. International Journal of Advanced Research in Computer Science, 4(11): 34–39.

Samarina, V.P., Skufina, T.P, Baranov, S.V. (2015). Power Efficiency of Russia's Economy: Problems of the Estimation and Increasing Directions. Actual Problems of Economics, 173(11): 127–136.

Sun, C., Jiao, H., Ren, Y. (2014). Regional Informatization and Economic Growth in Japan: An Empirical Study Based on Spatial Econometric Analysis. Sustainability, 6(10): 7121–7141 = doi:10.3390/su6107121.

Swift, M.J. (2014). Confronting the Informal in Good Governance: The Case of Decentralised Education System Reform in Guinea. Development Policy Review, 32(4): 399–425.

Syverson, C. (2011). What determines productivity? Journal of Economic Literature, American Economic Association, 49(2): 326–365.

Van Ark, B., O'Mahony, M., Timmer, M.P. (2008). The productivity gap between Europe and the United States: trends and causes. Journal of Economic Perspectives, 22(1): 25–44.

Walsham, G. (2010). ICTs for the Broader Development of India: An Analysis of the Literature. Electronic Journal of Information Systems in Developing Countries, 41(4): 1–20.

Yi, N., Wei, L. (2012). Research on the Development Countermeasure of China in the Context of Global Informatization. Business Computing and Global Informatization (BCGIN), 2012 Second International Conference on IEEE (pp. 395–398).

Стаття надійшла до редакції 2.01.2016.