ESTIMATION OF REGION'S INTELLECTUAL CAPITAL BASED ON THE SYSTEM OF INDICATORS: CASE OF THE RUSSIAN FEDERATION

Anna MALTSEVA
Candidate of Economic Sciences, Director of Lurye Scientific and Methodological Center for Higher School Innovative Activity, Tver State University, Tver,
80179@list.ru

Igor VESELOV
Candidate of chemical sciences, Senior researcher in Lurye Scientific and Methodological Center for Higher School Innovative Activity, Tver State University, Tver
igor.veselov@mail.ru

Evgeny BUKHVALD
Doctor of Economic Sciences, professor, Institute of Economics of Russian Academy of Sciences, Moscow
buchvald@mail.ru

Abstract
The paper presents an analytical review of modern sources on the issues of determining, classifying and evaluating a region's intellectual capital. The study identified the most common approaches to intellectual capital assessment, which need to be adjusted taking into account the specificity of the statistical reporting of the Russian Federation, and also because of the need for detailing certain types of intellectual capital. The authors proposed their own approach to assessing a region's intellectual capital using a system of indicators based on the calculation of the integral indicator tested on the example of the Russian Federation's regions. The authors have compiled a map of the intensity of the intellectual capital of the Russian Federation's regions, which is the basis for their comparison by the magnitude of the studied indicator, as well as benchmarking of the key areas of its development for outsider regions.

Keywords: intellectual capital, region, development, competitiveness, knowledge, knowledge economy
JEL classification: R19

1. Introduction

The relevance of the study of intellectual capital issues is due to the significant role of intangible factors in the modern conditions of the knowledge economy to achieve competitive advantages of the territories. The economic effect of the meso-level systems is increasingly determined by the level of generation, transfer and use of knowledge within the boundaries of their territorial location.

The goal of the country's scientific and technological development in the Strategy for the Scientific and Technological Development of the Russian Federation is to ensure the independence and competitiveness of the country through the creation of an effective system for building up and using to the fullest extent possible of the nation's intellectual potential.

Among the fundamental principles of state science and technology policy, the Strategy highlights the concentration of resources: the concentration of intellectual, financial, organizational and infrastructure resources to support research and development, the creation of products and services.

Exactly the concentration of intellectual potential as one of the most significant resources within the boundaries of a particular territory provides it the additional competitive advantages that necessary to respond to the great challenges facing the country (Lepskiy, 2018).

2. Literature Review

The review of the literature is below. It is the basis of highlighting the specific factors characterizing the high role of intellectual capital in regional development.

1. Intellectual capital is the most important resource of innovative socio-economic development, creating a competitive advantage of the territory, is a guarantor of its sustainable development, and is an indicator of its effectiveness.

Drucker (1992), Chen and Dahlman (2006), Liu Chao et al. (2015), Bronisz et al. (2012), Rusu-Tanas (2015), Ilič et al. (2016) define knowledge is as a key resource of the innovation economy, and the intellectual capital as a tool for transition to a new post-industrial society.

Kozak (2013) identified the specific and unique intangible resources among the key growth factors of countries and regions in the context of progressive globalization and liberalization processes.

An analysis of countries with advanced innovative development, such as Singapore, Taiwan, South Korea, Finland, Sweden, and others, demonstrates competitive growth opportunities due to intangible sources: the lack of physical, material capital compensate by a high level of intellectual resources in these countries (Teslenko, et al., 2014).

Many authors (Chub & Makarov, 2015; Kozak, 2013; Bronisz et al., 2012; Rusu-Tanas, 2015; Maltseva, 2018a) consider a well-developed regional intellectual capital management policy as the tool to preserve the sustainable development of territories and to reduce the negative effects of globalization.

The high role of intellectual capital in the formation of regions' "smart" specialization, leading to innovative growth, was shown in the work of Wiedenhofer et al. (2017). The author's points out that the concentration of intellectual capital in itself contributes to the development of entrepreneurial activity in knowledge-intensive industries within the territory, which can be interpreted as an additional development effect generated by the region's intellectual capital.

2. *Separate elements of intellectual capital are the basis of the knowledge economy and settle into fundamentally new qualities under its conditions.*

The basic criteria for the knowledge economy, highlighted by Drucker (1992), are elements of intellectual capital: educated and qualified personnel (human capital); economic incentives and institutional regimes; knowledge generating structures (research, consulting companies, and universities); modern information infrastructure (structural capital).

Intangible factors that ensure the transformation of regional socio-economic systems into integrated structures of fundamentally new quality - clusters, innovation networks are important sources of industrial and service industries growth in the region, as noted by Pachura (2010), Friedel (2007), Rusu-Tanas (2015).

3. *Intellectual capital is aimed at transforming the strategic priorities of the region into a social-oriented plane and formed under the condition of a territory's developed social infrastructure.*

Alexandrov & Fedorova (2017) consider territories' sustainable development under the influence of intellectual capital in a slightly different focus. The main targets for regional development are not the growth of budget revenues, corporations or gross regional product, as much as the increase in the people's life quality, which is determined by a number of factors, where indicators of education, health, culture, etc. are taken into account along with income. They contribute to the reproduction of the intellectual capital itself and determine the effectiveness of its use within the boundaries of the territory.

Teslenko, et al. (2014) based on European experience states that in the new global community the main factor for development is not quantitative factor (size of territories, population, etc.), but a qualitative factor (education of the population, state of science, creativity, innovative approach, social unity).

Similarly, Makarov (2011) points to a change in the type and meaning of a region's development, its socially oriented vector, which focuses on expanding human capabilities, not only as an increase in the country's material well-being.

4. *The role of intangible components in the formation of the products value at the micro level determines the importance of intellectual capital for indicators characterizing the total regional product*

Edvinsson (2002) was one of the first who investigated and proved in his works the role of intangible assets in the value's creation. Kozak (2013) considered knowledge as the main resource for value creation both at the corporate and regional level.

Serdyukova (2013) cites statistical data that demonstrate a steady increase in the share of intangible assets while simultaneously reducing the share of tangible assets that confirms the growing intellectualization of production.

Makarov (2011), defining the role of intellectual capital in the region, considers the formation of the products value at the micro level: an increasing proportion of the products value is made up of its intangible components - this or that knowledge, to obtain which the significant resources is needed and which gives value to products. The increasing importance of intellectual resources in the development of individual organizations leads to a corresponding increase in their importance in the region's development. As a result, the role of regional systems for generating, sharing and using knowledge is increasing (Makarov, 2015).

5. *Special properties of intellectual capital as a competitive resource of a territory (unlimited, renewable, self-growing, synergistic effect) create conditions for its most efficient use at the meso-level*

Serdyukova (2013) gave the essential features of intellectual capital, which determine its high significance for the development of territories: it belongs to complex forms of capital that has great potential for socio-economic activity leading to an increase in the competitiveness of countries and regions.

Efremenko (2010) considering the advantages of intellectual capital for the development of territories notes that it is the only factor of production, the growth of which has an unlimited resource, both in qualitative and quantitative parameters, and in time parameters. This has a particular importance at the present stage, when, due to the limited material capital, competition for it is increasing between the territories.

Stanishevskaya and Imaikin (2010) especially noted the long-term, synergistic nature of intellectual capital, characterized by a "delayed" effect of returns, which has a particular importance for the modern development of the country's economy.

Rusu-Tanas (2015) writes about the synergy resulting from the interaction between elements of intellectual capital within the borders of a particular territory.

3. Methodology

For the study purpose, we made an analysis of the terminological approaches to the definition of "region's intellectual capital", because of which the following definition of the concept was proposed.

The region's intellectual capital is a set of intangible resources, which are carried by separate regional socio-economic systems, structures and individuals, having, together with physical capital, direct or indirect influence on the achievement of current and future results by the region's socio-economic system as a whole (Maltseva, 2018b).

For the empirical substantiation of intellectual capital role for the current and future development of regions, an important task is its assessment, the issues of which are widely represented in the literature.

In the most sources, the evaluation of a region's intellectual capital is carried out based on a system of indicators allocated in accordance with the structural elements of a region's intellectual capital. They are the basis for calculating the integral indicator of a region's intellectual capital, which makes it possible to give its generalized assessment and to rank the regions according to the level of available intellectual capital.

The main difficulty in evaluating intellectual capital is in the fact that it represents an intangible resource, which cannot always be estimated by formal indicators. Certain indicators characterize it not directly, but indirectly, according to the result of its influence on a particular regional subsystem, while for the purity of the experiment, only those characteristics that show the presence of one or another type of regional intellectual capital are needed.

Due to the peculiarities of intellectual capital, there is a certain problem in establishing the correspondence between the system of traditional statistical indicators and key types of intellectual capital.

Thus, due to objective difficulties the assessment of a region's intellectual capital in the most cases has a framework approximate nature, while it remains very significant for managing intellectual capital at the level of an individual region.

As part of the study, we made an analysis of methodological approaches to the selection of indicators of a region's intellectual capital, which demonstrates the presence of very different points of view on solving the problem.

In some cases, classical classifications of intellectual capital types were chosen as the basis for structuring indicators (Bontis, 2004; Liu Chao et al., 2015; Lisichenok, 2004), including the detalization of individual components (Makarov, 2011; Monakhov, et al., 2016; Maltseva et al, 2018), in others cases a non-structured list of them is offered (Bronisz et al., 2012) or self-composed integrated groups is offered (Ivanova, 2013). The first approach seems to be the most expedient, since it is most capable of identifying various types of intellectual capital and determining its deficiency in various areas.

The methodology for structuring indicators, presented by Chub and Makarov (2015), it is necessary to highlight separately. In this methodology in addition to identifying the types of intellectual capital, the essential role of the estimated indicators is determined in accordance with three groups: investments, assets and effects.

Most authors (Ivanova, 2013; Liu Chao et al., 2015; Yeh-Yun Lin and Edvinsson, 2008; Bontis, 2004; Bronisz et al. (2012); Lubacha-Sember, 2016) estimate the intellectual indicator using integral indicator, for the calculation of which there are standard methods (Klyushnikova and Shitova, 2016):

1) Method by the sum of indicators (linear model).
2) Method by the sum of weighted average arithmetic group indicators.
3) Method by the product of weighted average geometric group indicators.
4) Distance method.

Yeh-Yun Lin and Edvinsson (2008) propose the calculation of the integral indicator of intellectual capital and its individual components as the sum of normalized values. Bontis (2004) used a similar approach from the standpoint of the methodology.

Lubacha-Sember (2016) used the Alpha-Cronbach coefficient as an indicator of compliance of indexes with the intellectual capital indicators.

In some cases, the authors move away from the integrated assessment of a region's intellectual capital and apply the rankings of individual indicators included in the assessment systems, and on the basis of their generalization, draw conclusions about the state of the indicator in general, as was done by Yeh-Yun Lin and Edvinsson (2008) in addition to the basic analysis.

Pöyhönen and Smedlund (2004) assessed the intellectual capital is based on interview results.

Thus, to assess a region's intellectual capital, various methodological techniques can be used, which involve the transformation of basic indicators to ensure comparability of results (rationing, standardization, maximin method) and the calculation of the integral indicator, for which average indicators are using (arithmetic or geometric), taking into account the specific weights (if available).

4. Results

For the purposes of statistical estimation of intellectual capital, it is proposed in this paper to use a system of indicators constructed in accordance with the structural classification of intellectual capital defined above and allowing the most accurate determination of available intellectual capital.

Data from the collected books of Federal Service of State Statistics, the collected book "The rating of innovative development of the Russian Federation's subjects" by the Higher School of Economics (HSE) (2017), and a number of ratings of the Russian Federation's subjects compiled by the Center for Regional Policy Development (CRPD) (2017), Association of Russia's Innovative Regions (ARIR) (2018), Rating Agency RIA RATING (RIA) (2016, 2017), Rating Agency RAEX (Expert RA) (2017) were selected as indicators

for this study. The period under investigation is 2014 and 2015. The used indicators are given in Table. 1.

The author's approach to the formation of the indicators system for assessing a region's intellectual capital is below (Table 1).

Table 1. Indicators of region's intellectual capital

Type of intellectual capital		Indicators	Source
		Human capital	
Knowledge capital	H1	Percent of employed population with higher education	Federal Service of State Statistics
	H2	Number of students studying under the bachelor's, specialist's, magistracy programs for 10 000 population, people	
	H3	Number of teaching staff engaged in educational activities in accordance with higher education programs per 1000 population, people	
	H4	Number of personnel engaged in R&D per 10,000 population, people	
	H5	Number of researchers with academic degrees per 1000 population, people	
	H6	Graduation from the postgraduate program per 10 000 population, people	
	H7	Graduation from the doctoral program for 10 000 population, people	
Capital of competences	H8	Number of employees who received additional vocational education from the number of workers on payroll of the relevant categories of personnel and age, %	Federal Service of State Statistics
	H9	Number of employees who have undergone vocational training in basic professional education programs from the number of workers on payroll, in%	
	H10	Number of employees who received professional education in basic professional educational programs from the number of workers on payroll, %	
	H11	Graduation of skilled workers and employees per 10 000 population, people	
	H12	Graduation of mid-level specialists for 10,000 population, people	
	H13	Share of employed in high-tech and mid-tech branches of industrial production in the total number of employed in the region's economy	HSE
	H14	Share of employed in knowledge-intensive sectors of the service sector in the total number of employed in the region's economy	
	H15	Use of special software in organizations per 100 organizations, units	Federal Service of State Statistics
	H16	Use of electronic document management in organizations per 100 organizations, units	
	H17	Used advanced production technologies per 100 organizations, units	
	H18	Share of organizations that carried out technological innovations in the total number of organizations (organizations of industrial production)	HSE
	H19	Share of organizations that carried out non-technological (marketing and / or organizational) innovations, in the total number of organizations (organizations of industrial production)	
	H20	Number of employees who received training in the form of short-term courses, professional trainings, mentoring from the number of workers on payroll, %	Federal Service of State Statistics
Capital of professional experience	H21	Number of articles published in peer-reviewed journals, indexed in Russian Science Citation Index, per 10 researchers, units	HSE
Capital of professional and personal reputation	H22	Rating of governors, point	CRPD
Health Capital	H23	Morbidity per 1000 population, people	Federal

			Service of State Statistics
		Reputational capital	
Image capital	R1	Rating of the Russian Federation's subjects by the value of the Russian regional innovation index, index	HSE
	R2	Rating of innovation regions of Russia, index	ARIR
	R3	Rating of the socio-economic situation of the Russian Federation's subjects, index	RIA
	R4	Rating of Russian regions for life's quality, index	
	R5	Investment climate of regions, index	Expert RA
	R6	Balance of migration growth of persons with higher professional education, persons	Federal Service of State Statistics
	R7	Balance of migration growth of doctors of science; candidates of sciences, persons	
Customer capital	R8	Share of organizations that participated in joint projects for the implementation of R&D, in the total number of organizations (organizations of industrial production)	HSE
Brand capital	R9	Share of exports in the total volume of shipped products *	
	R10	Share of exports of technologies and services of a technical nature in total exports *	Federal Service of State Statistics
	R11	Turnover of retail trade per capita, rubles	
	R12	Turnover of wholesale trade in the total volume of shipped products *	
	R13	Share of innovative goods, works, services in the total volume of shipped goods, performed works and services (organizations of industrial production)	
	R14	Share of newly introduced or subjected to significant technological changes of innovative goods, works, services, new to the market, in the total volume of shipped goods, performed works and services (organizations of industrial production)	HSE
		Infrastructure capital	
Capital of regional environment	I1	Number of spectators of theaters and number of visits to museums per 1000 population, people	Federal Service of State Statistics
	I2	Rating of the Russian Federation's subjects by the value of the index "Socio-economic conditions of innovative activity", index	HSE
	I3	The labor market index in the regions of the Russian Federation, index	RIA
Capital of regional management system	I4	Rating of the Russian Federation's subjects by the value of the index "Quality of innovation policy", index	
	I5	The presence of a strategy (concept) of innovative development (innovation strategy) and / or a profile section on innovation development (innovation support) in the development strategy of the region, the presence / absence	
	I6	The presence of the designated zones (territories) of priority development of innovation activity in the scheme of territorial planning, as well as in the materials for its justification, the presence / absence	
	I7	The presence of a specialized legislative act that defines the basic principles, directions and measures of state support for innovation activities in the region, the presence / absence	HSE
	I8	The presence of a specialized program or a set of measures of state support for the development of innovations, innovation activities or subjects of innovation activity, the presence / absence	
	I9	The presence of specialized coordination (advisory) bodies on innovation policy (support of innovation) affiliated to the highest official or the highest executive body of state power of the Russian Federation's subject, the presence / absence	
	I10	The presence of specialized regional development institutions (funds, agencies, development corporations, etc.) with the functional to support of innovation subjects and / or the	

		implementation of innovative projects, the presence / absence	
Capital of regional infrastructure	I11	Managerial risk (rating), point	Expert RA
	I12	Supply of general education organizations	Federal Service of State Statistics
	I13	Supply of professional educational organizations, which training qualified workers	
	I14	Supply of professional educational organizations, which training mid-level specialists	
	I15	Supply of organizations, which training postgraduate students	
	I16	Supply of organizations which training doctoral students	
	I17	Population per hospital bed, persons	
	I18	The capacity of out-patient polyclinic organizations per 10 000 people, visits per shift	
	I19	Number of sports facilities per 10000 population, units	
	I20	Library fund per 1000 population, units	
	I21	Population coverage by TV and radio broadcasting, %	
	I22	The share of trapped and detoxified air pollutants in the total number of waste pollutants from stationary sources	
	I23	Number of active fixed and mobile broadband Internet subscribers per 100 population	
	I24	Number of active fixed and mobile broadband Internet subscribers per 100 population	
	I25	Intensity of use of information and communication technologies in organizations,%	
	I26	Intensity of use of information and communication technologies in organizations,%	
	I27	Percentage of organizations that has a website	
		Innovative capital	
Capital of Intellectual Property	IP1	Number of issued patents per 1000 population, units	Federal Service of State Statistics
	IP2	The share of organizations that has ready technological innovations, developed by own strength, in the total number of organizations (organizations of industrial production)	HSE
Capital of ideas and projects	IP3	Number of patent applications per 1000 population, units	Federal Service of State Statistics
	IP4	Rating of the Russian Federation's subjects by the value of the index "Scientific and Technical Potential", index	HSE
	IP5	Rating of the Russian Federation's subjects by the value of the index "innovation activity", index	

Source: Authors' calculations

For each group of indicators that characterize the group of intellectual capital, the coefficient of internal consistency of Cronbach's alpha was calculated separately for each year, the threshold value of which is set equal to 0.7.

The obtained values that were above the threshold value are either very close to it (0.680), which allows us to speak about the internal consistency of the indexes of each type of intellectual capital and the appropriateness of studying the selected groups.

All indicators, except indicator ones, were investigated for deviation from the normal distribution. Indicators with a distribution different from normal were normalized according to the formula:

$$\tilde{x} = \sqrt[a]{x},$$

x - the initial value of the indicator, $\tilde{x}$ is the normalized value of the indicator, a is the degree of transformation (determined experimentally from 2 to 4 in such a way that the coefficient of asymmetry is less than 0.5).

The coefficients of variation were calculated for normalized data.

The highest variation is noted for the number of people graduated from the doctoral program, as well as organizations that carried out their training; share of people employed in high-tech and mid-tech branches of industrial; people in knowledge-intensive service industries; share of organizations engaged in technological and non-technological innovations, as well as having ready-made technological innovations developed using company's own resources; the share of innovative goods, works, services in the total volume of shipped goods, performed works, services, including newly introduced or subjected to significant technological changes.

These indicators has significant values in highly developed regions and very low values in the Russian Federation's regions with insufficient scientific and innovative potential.

It is obvious that a high variation is typical for indicators representing regional indices and ratings.

All initial values were normalized for reduction to a single scale:

$$x' = \frac{\tilde{x} - \tilde{x}_{\min}}{\tilde{x}_{\max} - \tilde{x}_{\min}},$$

where $\tilde{x}$ is the normalized value of the indicator, $\tilde{x}_{\min}$ is the minimum value of the indicator, $\tilde{x}_{\max}$ is the maximum value of the indicator. Indicators H23 ("Morbidity per 1000 population") and I11 ("Management risk (rating)") after the normalization were inverted as $1 - x'$, because they negatively affect the final result.

For the four components of intellectual capital, subindexes were calculated using the distance method:

$$I_{\text{к}} = \sqrt{\sum (1 - x'_i)^2}.$$

For the distance method, the smallest value of the index is characterizes the greater significance.

The final index of the regions' intellectual capital is in the Table 2, and it was obtained by the product of the components:

$$I = I_{HC} \cdot I_{RC} \cdot I_{IF} \cdot I_{IP},$$

where I_{HC} is the index of human capital, I_{RC} is the index of reputational capital, I_{IF} is the index of financial capital, and I_{IP} is the index of capital of intellectual property.

Table 2. Index of regions' intellectual capital (top-20).

Region	2014		2015	
	score	rank	score	rank
Moscow	6,167	2	4,300	1
Republic of Tatarstan	6,792	3	5,950	2
Saint Petersburg	4,934	1	6,455	3
Tomsk region	13,091	4	11,680	4
Republic of Bashkortostan	15,260	7	13,461	5
Nizhny Novgorod region	14,160	5	13,742	6
Voronezh region	17,452	11	13,947	7
Kaluga region	16,728	9	14,195	8
Sverdlovsk region	14,701	6	14,792	9
Novosibirsk region	17,185	10	14,997	10
Chuvash Republic	18,036	13	15,684	11
Khabarovsk region	16,070	8	16,155	12
Krasnoyarsk region	19,435	17	17,128	13
Lipetsk region	18,937	15	17,368	14
Yaroslavl region	17,673	12	17,504	15
Chelyabinsk region	19,445	18	18,244	16
Republic of Mordovia	20,139	19	18,262	17
Perm region	19,197	16	18,664	18

Region	2014		2015	
	score	rank	score	rank
Rostov region	21,167	21	18,893	19
Moscow region	20,644	20	19,282	20

Source: Authors' calculations

The presented data show the leading positions of the Moscow, St. Petersburg, Republics of Tatarstan and Bashkortostan, Tomsk and Nizhny Novgorod regions on the integral value of intellectual capital. Fluctuations in the values over periods are evident. It is worth noting the gap between the values of the integrated indicators of the top-10 regions: the first three regions has very low scores (this corresponds to the ranking rule) (Figure 1).

Figure 1. Regional intellectual capital intensity

Source: Authors' calculations

The presented assessment of the regions allows us to see the place of each of them in the rating and to evaluate the competitive advantages of the subjects having higher positions for the purpose of benchmarking. At the same time, the strengths and weaknesses themselves can be studied in terms of specific types of intellectual capital and indicators that characterize them, which provides a detailed analysis.

5. Conclusion

An effective regional intellectual capital management policy can be an effective tool for achieving high rates of economic growth, competitiveness and sustainability. All this is due to the high role of the knowledge component in the sectors of the economy and the social sphere at the present stage.

The results of the study are the basis for further study of a region's intellectual capital, in particular its impact on the effectiveness of socio-economic development, sustainability, as well as identifying the role of universities and other structures that generate it, on the level of its concentration within the boundaries of their location.

Acknowledgements

The paper is the result of the research funded by the Ministry of Education and Science of the Russian Federation within the research project «Scientific and methodological basis for the creation of competence centers on the platform of regional universities on the basis of the concept of intellectual capital» implemented by Tver State University.

References

Alexandrov, I.N. & Fedorova, M.Y. (2017). Evaluation of the intellectual capital of regions and territories. Proceedings of scientific and educational-practical conference Strategic management of organizations: modern technologies, Peter the Great St. Petersburg Polytechnic University, St. Petersburg.

Bontis, N. (2004). National Intellectual Capital Index: a United Nations initiative for the Arab region. Journal of Intellectual Capital, 5, 13–39.

Bronisz, U., Heijman, W. & van Ophem, J. (2012). The assessment of intellectual capital in polish regions, Applied Studies in Agribusiness and Commerce, 6, 101-105.

Chen, D.H.C. & Dahlman, C. J. (2006). The Knowledge Economy, The KAM Methodology And World Bank Operations, The World Bank, Washington.

Chub, A.A. & Makarov, P.Y. (2015). Intellectual capital as a factor of sustainable development of Russian regions, Business strategies, 6(15), 24-32.

Drucker, P. (1992). The New Society of Organizations, Harvard Business Review

Edvinsson, L. (2002). The new knowledge economics, Business Strategy Review, 13(3)

Efremenko, V.F. (2010). Region's intellectual capital flow in the open economy, Innovation, 7 (141), 86-89

Friedel, L. (2007). Intellectual Capital and Region as a Knowledge Cluster, Technical University of Košice, Faculty of Economics, 2nd Central European Conference in Regional Science – CERS

Ilič, B., Bernjak, S. and Rus, A. (2016). Intellectual capital as an indicator of regional development: the case of the Slovenian region of Pomurje, Teorija in praksa, 53(3), 579-604

Investment climate of the regions - 2017, [onlain], https://raexpert.ru/ratings/regions/2017/att1 (Accessed 11.07.2018).

Ivanova, V.J. (2013). Intellectual capital assessment modeling at the regional level, The collection of scientific works of Russia's universities "Problems of economy, finance and production management", 34, 115-119

Klyushnikova, E.V. & Shitova, E.M. (2016). Methodological approaches to calculation of integral index, ranking methods, Electronic Journal InnoCentre, 1(10), 4-18

Kozak, M. (2013). Intellectual Capital as a Key Factor of Socio-Economic Development of Regions and Countries, Procedia Economics and Finance, 6, 288-295

Lepskiy, V. (2018). Reflexive self-organizing decision support systems for development governance, International Journal of Engineering and Technology (UAE), 7(2), 255-258

Lisichenok, E.P. (2004). Determination of the structure of region's intellectual capital on the basis of its research at the enterprise level, Bulletin of Sukhoi State Technical University Of Gomel, 15, 62-68.

Liu Chao, Li Xiao & Xu Lingyu (2015). The Influence of Regional Intellectual Capital on Regional Economic Development-Evidence from China, International Journal of u- and e- Service, Science and Technology, 8(6), 91-104.

Lubacha-Sember, J. (2016). Intellectual Capital of the European Union Regions, on example of the Visegrad Countries regions, In: Building Bridges: Cities and Regions in a Transnational World RSA Annual Conference. Graz, Austria.

Makarov, P.Y. (2011). The role of the intellectual capital on the economic development of the region, Bulletin of the Pushkin Leningrad State University, 6, 109-120

Makarov, P.Y. (2015). The system model of the region's intellectual capital, Financial analytics: science and experience, 24 (258), 45-54

Maltseva, A.A. (2018a). Intellectual capital of universities and regions: A qualitative analysis of mutual influence's directions, Espacios, 39(20), 18

Maltseva, A.A. (2018b). The problem of «regional intellectual capital» definition and its level structure, Bulletin of Tver State University. Series: Economics and Management, 2, 222-228.

Maltseva, A., Veselov, I., Lelchitskiy, I., Gridchina, A., Maimina, E. (2018). The role of university's intellectual capital in creation of scientific activity's results, International Journal of Learning and Intellectual Capital, 15(3), 204-218

Monakhov, I.A., Barsukova, N.E. and Klyushnikova, E.V. (2016). Methodology and practice of development management of Russian Federation' science cities at the present stage: monograph, ed. by A. A. Maltseva, Tver, Tver State University, 203 p.

Pachura, P. (2010). Regional Cohesion. Effectiveness of Network Structures, Berlin, Heidelberg : Physica-Verlag Springer Company.

Pöyhönen, A. & Smedlund, A. (2004). Assessing intellectual capital creation in regional clusters, Journal of intellectual capital, 5 (3), 351-365

Rusu-Tanas, M. (2015). Intellectual Capital a Strategic Factor of Socio-Economic Development of Regions and Countries, Procedia Economics and Finance, 27, 369-374

Serdyukova, L.O. (2013). Formation, development and use of intellectual capital in the innovation system. Author's diss. Abstract of Doctor. of Econ. Sciences, Saratov [onlain], http://www.sstu.ru/upload/iblock/e92/s_161013.pdf (Accessed 11.02.2019).

Stanishevskaya, S.P. and Imaikin, E.A. (2010). Management of intellectual capital in the region based on the interaction of the regional education system and the labor market, Bulletin of Perm State University, 2(5), 6-14

Strategy of scientific and technological development of the Russian Federation, [onlain], http://www.consultant.ru/law/hotdocs/48053.html/ (Accessed 11.02.2019).

Teslenko, I.B., Kovalenko, S.Y., Saveliev, I.I., and Nauchigin, K.M. (2014). Intellectual capital and innovative development of the region: monograph, Vladimir state university named after Alexander and Nikolay Stoletovs, Financial University under the Government of the Russian Federation, Vladimir, VlSU Publishing House, 192 p.

The rating of innovation development of the Russian Federation's subjects. Higher School of Economics, [onlain], https://www.hse.ru/data/2017/06/22/1170263711/RIR2017.pdf (Accessed 11.07.2018).

The rating of Center for Regional Policy Development, [onlain], http://www.profile.ru/politika/item/116527-rejting-gubernatorov-rossii (Accessed 11.07.2018).

The rating of innovative regions of Russia, [onlain], http://i-regions.org/images/files/airr17.pdf (Accessed 11.07.2018).

The rating of Russian regions for life's quality - 2016, [onlain], http://riarating.ru/infografika/20170220/630056099.html (Accessed 11.07.2018).

The rating of regions on adherence of the population to a healthy lifestyle - 2017, [onlain], http://riarating.ru/infografika/20170921/630073305.html (Accessed 11.07.2018).

Wiedenhofer, R., Friedl, C., Billy, L., and Olejarova, D., (2017). Application of IC-models in a combined public-private sector setting for regional innovation in Slovakia, Journal of Intellectual Capital, 18(3), 588-606, https://doi.org/10.1108/JIC-11-2016-0110

Yeh-Yun Lin, C. and Edvinsson, L. (2008). National intellectual capital: Comparison of the Nordic countries, Journal of Intellectual Capital, 9(4), 525-545