Strategic prospects for the development of human capital in the context of singularity and intellectualization of the Russian economy

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Abstract. A comparative analysis of the relationship between the development trends of the modern information society and high-tech production in Russia and the world is carried out, the possibilities of intellectualization of the Russian economy in terms of the implementation of the principle of singularity are determined. The authors' attention is focused on studying the development trends of Russian education in a historical perspective and analyzing the development model of human capital in the context of the transition of the world and Russian economies to a new technological structure, the hallmark of which is the general intellectualization of society. Based on the analysis of empirical data, it is concluded that modern society is very different from the society that was characteristic of the last century, which requires a new structure (construction) and a completely different educational content. The necessity of developing a new model of the education system of the XXI century as the basic basis for the development of human capital is justified, taking into account the key features of modern intellectual society and the principle of singularity.

1. Introduction
The specificity of modern society in the age of universal intellectualization and digitalization is the growth of scientific and technological progress, which occurs in two stages. At the first stage, the growth has a linear nature of change, and the second, which is called exponential, is characterized by a special property, defined as a singularity.

Currently, it is difficult to find a scientist or economist who would not recognize that the fifth (and major) factor of economic growth and development of modern society (along with such factors as land, labor, capital, entrepreneurial qualities) is intellectual (knowledge) capital [1–4]. And only those countries that actively create and use new knowledge, that is, their economies are characterized by growing intellectual intensity, will be able to become highly developed countries that are able to hold the leading position in the world economic arena by 2030-2050. At present, there is no sphere of activity that has not undergone significant changes caused by the Fourth industrial revolution. These changes occur with exponential acceleration. According to K. Schwab and N. Davis [4], exponential development of society takes place in the second phase of the industrial revolution. Technological changes associated with it form a new system of values, which is constantly changing and transforming the existing culture and lifestyle of society, the education system, through which the new
knowledge and skills are transmitted. All this determined the relevance of the substitution of the traditional model of human capital development according to which students should obtain a standard set of highly specialized skills, necessary for employee to perform certain functions and/or a limited group of functions, by a new model which focuses on the development of flexible skills and abilities and contains the idea of inter- and transdisciplinary approaches to learning. Thus, the main goal of this work is to determine the strategic prospects for the development of human capital in the context of the singularity and intellectualization of the Russian economy and building a new education model based on the development of soft skills and abilities among students.

2. Materials and Methods

In this article, the authors use statistical indicators obtained from official sources of Federal State Statistic Service (Rosstat), characterizing the state of technological development in Russia and the world powers. The work uses scientific data on the relationship of technological changes in the modern economy and the formation of the educational system and competency models of the 21st century, obtained from open sources. The article uses the results tested by the authors at a research seminar on the formation of soft (flexible) skills for the development of bioeconomics (November 2018) in St. Petersburg State University of Economics.

The grouping and system analysis of empirical data made it possible to identify the main features of technological development and advanced production technologies that characterize the current state of the Russian economy. The extrapolation of the research results allowed us to determine the strategic prospects for the development of human capital in the context of the singularity and growing intellectualization of the Russian economy.

3. Results and Discussion

According to the number of advanced production technologies developed (including new ones for Russia) by types of economic activity in the Russian Federation as a whole (table 1) it is obvious that the growth rate of the total volume of advanced technologies developed in Russia amounted to +77.55%, including new ones for Russia +76.12%. According to Rosstat, in general, the research and development costs in priority areas of science, technology and engineering development in Russia for the period from 2010 to 2017 also have a low share in GDP.

Table 1. Number of developed advanced production technologies (including new ones) by type of economic activity in Russia as a whole, units [1]

| Types of economic activity                      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Growth, % 1 |
|------------------------------------------------|------|------|------|------|------|------|------|-------------|
| Total                                          | 864  | 1138 | 1323 | 1429 | 1409 | 1398 | 1534 | 177.55      |
| Total new for Russia                           | 762  | 1028 | 1188 | 1276 | 1245 | 1223 | 1342 | 176.12      |
| High-tech economic activities                  | …    | …    | 79   | 116  | 133  | 152  | 134  | 169.62      |
| High-tech economic activities new for Russia   | …    | …    | 73   | 107  | 123  | 144  | 120  | 164.38      |
| The share of internal research and development costs in priority areas of science, technology and engineering | 1.13 | 1.01 | 1.03 | 1.03 | 1.07 | 1.1  | 1.1  | 97.35       |

1 The growth of the indicator according to the criteria of “Total”, “Total new for Russia” and “the Share of internal costs for research and development in priority areas of science, technology and engineering, in the total volume of internal costs for research and development in Russia as a whole” is defined as the ratio of the current indicator to the value of 2010. According to the criteria “High-tech activities” and “High-tech activities new to Russia”, the growth rate was calculated as the ratio of the current value of the indicator to its value for 2012.
In terms of research and development costs in priority areas of science, technology and engineering development in Russia, 2011 was a failure when its share amounted to only 1.01% of GDP. Further, over the years, we can observe a small increase which although remains low compared to the more developed world powers. This dynamics is undoubtedly related to the factors that influence the development of the leading sectors of the country's economy, and above all, it is a consequence of the breakage of the Russian old political system and the formation of a new market economy, which for decades pushed Russia away from the world scientific and technological progress, as well as associated with the economic crisis of 2008. Generally, the data provided above in tables demonstrate the potential for the development of high-tech sectors of the economy, which will contribute to its intensive intellectualization, which will be able to bring Russia to another level of development and allow it to become a developed country in the world economic arena. A typical example is the development of nanotechnology in our country.

In recent decades, according to Moore's law, all world production is becoming intelligent and striving for miniaturization, what makes nanotechnology widespread and significant. Most countries of the world make huge investments in the development of nanotechnology products. Thus, the share of global investments in the development of nanotechnology significantly increased from the beginning of this century to 2011 (table 2).

Table 2. Share of global investments in nanotechnology in the early XXI century and 2011 [6]

| Country, region | Share of global investments in nanotechnology, % |
|-----------------|-----------------------------------------------|
|                 | Starting of XXI century | 2011 |
| USA             | 33.0                      | 46.0 |
| China, Taiwan, South Korea, Japan | 20.0 | 20.0 |
| France, Germany, Finland, Switzerland, Italy, Sweden, Denmark, Netherlands | 15.0 | 28.0 |
| Australia, Canada, Mexico, Israel, New Zealand, Malaysia, Thailand, Singapore, Philippines | – | 6.0 |
| Russia          | –                          | 12 place |

According to data presented in table, since the beginning of the XXI century the whole world has been actively investing in the development of priority nanotechnology, including bionanotechnology, while Russia has only begun to make the first attempts to enter this market and invest in nanotechnology, especially biotechnology. The growth of nanotechnology in the world and in Russia is shown in table 3.

Table 3. Growth of nanotechnology indicators in the world and Russia [6]

| Nanotechnology growth Indicators | 2008 | 2015 | Growth rate 2015/2008, % | Average annual growth rate, % |
|----------------------------------|------|------|--------------------------|-------------------------------|
Table 3 shows that despite the insignificant share of Russia in the development of world nanotechnology in 2008, by 2015 this figure has increased more than 4 times, which indicates: a) the rapid average annual growth rate of this indicator; b) the great attractiveness of this sector of the economy, especially the investment attractiveness in Russia and in the whole world.

The analysis of the dynamics of the development and use of nanotechnology in Russia for the period from 2010 to 2017 is clearly shown in table 4. The peak of state investments in the development of nanotechnology falls on 2015. In 2016, as well as in 2017, their number has a negative trend.

| Global nanotechnology market, billion US dollars | 700.0 | 1200.0-1500.0 | 171.4-214.2 | 108.0-112.0 |
| Production volume of nanotechnology in Russia, Billion rub. | 20.0 | 900.0\(^2\) | 4500.0 | 172.0 |
| Russia's share in the global nanotechnology market, % | 0.1 | 3.0 | 4285.7 | 330.3 |

Table 4. Volume of nanotechnology in Russia [6]

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Number of nanotechnologies developed, units | 222 | 258 | 327 | 411 | 443 | 505 | 494 | 446 |
| The number of nanotechnologies used in Russia, units | 354 | 526 | 748 | 907 | 937 | 1152 | 1166 | 1144 |
| The share of developed nanotechnologies in the volume of all used, % | 62.70 | 49.05 | 43.72 | 45.31 | 47.28 | 43.84 | 42.37 | 38.99 |

Generally, these figures demonstrate, on the one hand, the positive dynamics of investments in nanotechnology, both in the development and in their use; on the other hand, the analysis of trends in the share of nanotechnology developed in Russia in the total volume of their use indicates insufficient satisfaction of the demand of Russian consumers in nanotechnology, that is, a low level of saturation of the Russian market. Moreover, this indicator has a long-term negative trend, which in 2017 amounted to just over 62% of the level in 2010. In all probability, this phenomenon can be explained by the influence of such factors as: a) the challenges that are a consequence of the economic crisis of 2008; b) strengthening of political and economic sanctions of Western countries against Russia; c) the fall in oil prices on the global energy market, and as a consequence, reduced income of most promising sectors of the Russian economy (particularly the oil and gas sector), which is a continuation of the economic crisis.

All these factors could not but affect the development of nanotechnology in Russia.

At the same time, major technological changes are taking place on a global scale, associated with the Fourth Industrial revolution, combined with changes in the socio-demographic environment, which lead to a gradual and rather intensive replacement of traditional professions and specialties in the labor market with completely new ones that did not exist before. The basic principle of economic growth

\(^2\) Including 180.0 billion rubles for export
becomes the principle of “singularity”\(^3\) [2, 7, 8]. The development of modern society on the principle of singularity can be shown by data presented in table 5, which clearly demonstrate the speed of their mass appearance.

**Table 5.** Diffusion of new technologies and applications [3]

| Technologies and applications | Year of technology and application | The time it took technologies and applications to acquire 100 million users, years |
|-------------------------------|-----------------------------------|-----------------------------------|
| Telephone                     | 1878                              | 75                                |
| Mobile phone                  | 1979                              | 15-20                             |
| Internet                      | 1990                              | less 10                           |
| iTunes                        | 2003                              | about 8                           |
| Facebook                      | 2004                              | about 5                           |
| Apple App Store               | 2008                              | less 3                            |
| WhatsApp                      | 2009                              | about 4                           |
| Instagram                     | 2010                              | less 3                            |
| Candy Crush                   | 2012                              | less 2                            |

According to data from Table 5, the reduction of the time lag between the creation of technology and scaling up of its use for more than a century is 37.5 times! This phenomenon continues to occur according to the exponential law of development.

Major changes, which can be defined as Megatrends, come with great acceleration and concern the workplace, company, and society as a whole. More clearly megatrends that occur at different levels of management can be shown in the following form (table 6).

**Table 6.** Megatrends, their impact on the workplace, company and society [9]

| Megatrend         | Working place | System of workplaces (company) | External environment (society) |
|-------------------|---------------|--------------------------------|-------------------------------|
|                   | Instrument    | Material | Product | Management | Logistics | Regulator s | Class of consumers |
| Digitalization    | XXXX          | XX       | XXXX    | XXXX       | XXXX      | XXX        | XXX               |
| Automation        | XXXX          | XX       | XXXX    | XXXX       | XXXX      | XXX        | X                 |
| Globalization of technology | XXX | XX | XXXX | XXXX | XXXX | XXXX | XXXX |

\(^3\) The concept of “singularity” (in this work formulated as the principle of singularity) was introduced by mathematician John von Neumann, and later this principle was practically applied by futurologist Ray Kurzweil who explained the dynamics of technological progress in society. In his model, R. Kurzweil determined the point of technological singularity as the moment of acceleration of pace of discoveries to speed when progress goes beyond the limits of human understanding. The futurologist predicts that the time when the possible application of new technological discoveries will go beyond the understanding of mankind will come soon and it happens in 2045 [8].
This table, on the one hand, clearly demonstrates the cross-cutting nature of some trends that have an impact at all levels of management (including at the level of the workplace, the company and society as a whole). On the other hand, it is obvious that digitalization and automation are most influential at the level of the workplace (tool and product), and globalization, ecologization, demographic changes and networking of society are significant at the level of the external environment (society). These changes cannot but present new requirements to the education system, which fundamentally transform the new structure and content of education, in particular its competence model [10]. If we conduct a qualitative analysis of the development of education and its main goals in Russia over the past century [11], we can obtain the following comparative characteristics (table 7).

### Table 7. Specifics of the Russian education system over the past 100 years

| Periods                  | Education’s character                                                                 | Main objectives of education (acquired skills)                                                                 |
|--------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Until the 40s of XX century |Mass education                                                                      |Learning to read, write, count                                                                                   |
| Post-war period to the end of XX century | 1. Utilitarian nature of industrial education  
2. Specialized vocational education (specialized higher education institutions, engineering technical schools, special courses, etc.) | Acquisition of skills required in a particular profession                                      |
| Starting of XXI century | 1. Integral character of education;  
2. Individualized, unique education due to elective (multivariate) disciplines and knowledge that can be obtained by anyone (for example, online) | Acquisition of both basic and special (professional) competencies: 1) basic competencies – “4K”: communication, creativity, critical thinking, teamwork; 2) special skills |
Table 8. Basic skills XXI century [14–16]

| № | Skills of XXI century | Content |
|---|-----------------------|---------|
| 1 | Contextual/ highly specialized skills | Include, but are not limited to, hard skills. These are skills that are developed and applied in a particular context. These can be professional skills (such as programming in a specific language), physical skills (such as driving a car), or social skills (such as video blogging) |
| 2 | Cross-context/ General skills | Skills that can be applied in broader areas of social or personal activity: reading, writing, time management, teamwork skills |
| 3 | Meta Skills | These are the various modes of controlling objects in our mind or in the physical world, close to what are called “multiple intelligences” or “intelligence modalities”, from the logical-mathematical to the bodily-kinesthetic and interpersonal |
| 4 | Existential skills | Skills that can be universally applied throughout a person's life and in different life contexts. They include the ability to set goals and achieve them (willpower), self-awareness/ self-reflection (mindfulness, metacognition), the ability to learn/ unlearn/ relearn (self-development) |

In this system of grouped basic skills, the most popular are the following labor skills and abilities (abilities), which were reported by K. Schwab and N. Davis at the Davos economic forum in 2016 (table 9) [3, 17].

Table 9. Change in demand for basic labor skills in 2015-2020

| Labor skills | Demand for labor skills in 2020, % | Proportion of occupations whose core labor skills include skill groups, % |
|--------------|-----------------------------------|---------------------------------------------------------------------|
|              | 2020 | 2015 |                      |
| Cognitive ability | 15   | 52   | less than 20        |
| System skills   | 17   | 42   |                      |
| Solve complex problems | 36   | 40   |                      |
| Ability to work with content | 10   | 40   | less than 25        |
| Production skills| 18   | 39   | 20                    |
| Social skills   | 19   | 37   |                      |
| Resource management skills | 13   | 36   | less than 25        |
| Technical skills | 12   | 33   |                      |
| Physical abilities | 4    | 31   |                      |

The above skills and abilities are related to general, meta-and existential skills. It is clear from this table that all the skills listed are inter - and transdisciplinary [18]. It should be noted that the works of many domestic researchers, such as S. Glazyev, S. Pshenichny, Chulanova O.L. etc. [4, 19–25] have
been devoted to the analysis of the transformation processes taking place in the modern digital economy and their influence on changes in workers’ skills requirements, as well as the development of human capital in general. However, according to the authors, many of them ignore the principle of technological singularity, formulated by futurist Ray Kurzweil [8] who explained the dynamics of technological progress in modern society, which allows determining the bifurcation point when technological progress goes beyond the limits of human understanding. Based on this thesis, the authors deal with the following questions:

What are the requirements for the modern educational system of the social changes taking place in society?

What changes will be required by the modern educational system as the basis of human capital development, considering the key features of modern intellectual society and the principle of singularity?

The answers to these and many other questions create the prerequisites for further scientific discussion and open prospects for new scientific research. In this work, the authors attempt to outline only the main directions and contours of those changes that will be required in the foreseeable future in the context of the development of human capital in the context of singularity and intellectualization of the Russian economy.

A comparative analysis of the modern digital society of the XXI century and traditional industrial society of the XX century allows us to highlight the following features that help to form a model of the 21st century human capital development system for the purposes of the intellectual economy (table 10).

Table 10. Comparative analysis of the modern society of the XXI century and traditional society of the XX century [2, 7, 16]

| Comparison criteria          | Traditional society of the XX century | Modern (singular) society of the XXI century |
|------------------------------|---------------------------------------|---------------------------------------------|
| The predictability of the world | Predictability, stability              | Unpredictability, variability               |
| Main goal                    | “Production optimization”, “benchmarking” | Continuous and rapid innovation             |
| Character goals              | Achieving the goals of the plan        | Floating targets, continuously changing targets |
| Main management’s function   | Planning                               | Maneuvering                                 |
| Business model               | Security is not subject to “hacking”   | Subversion, is subject to “hacking”         |
| Minimum order quantity (batch size) | Standardization, unification          | Personalization, uniqueness                 |
| Control model                | Trust built on verification            | Trust built on engagement, inspiration      |
| Product life cycle           | Relatively long                        | Relatively shot                             |
| Success criterion            | Productivity                           | Corporate intelligence                      |
| Mental model, model of intelligence | IQ (intelligence quotient, human mental development) | EQ (communication skills, human emotional intelligence) |
| Character of training        | Stable                                 | Continuous (Lifelong Learning)              |
| Approach to staff development | Monomodal, focused on solving one category of problems (either tactical (short-term) or strategic (long-term)) | Bimodal, focused on both tactical (short-term) and strategic (long-term) tasks |
Character of economic development of industrialization and transition to a post-industrial society, accompanied by automation rapid industrial growth.

Transition to the Fourth industrial revolution, characterized by intellectualization, miniaturization, digitalization.

Analysis of the table allows us to note that modern society differs a lot from the society that was characteristic of the last century and it requires a new structure (construction) and a completely different content of education.

The model of the education system of the XXI century for the purposes of modern society should be built on the basis of the features of the modern intellectual society and the principle of singularity. In our opinion, it should be developed in the following directions: 1) creation of personalized environments (man-IT), creation of unique (personal) educational technologies and trajectories; 2) Development of global environments and educational platforms (so-called “universities per million students”); 3) formation of collective environments (man-man), communities of practices that provide support or mentoring; 4) creation of local environments representing local ecosystems of continuous education; 5) creation of environments for self-education of students at any time and in any place.

The basic principles of such a system should be:

1) consistency and complexity designed to provide interdisciplinary and multidisciplinary training. The approach to learning involves learning from many disciplines, that is, from different sides. With this approach: each participating discipline does not lose its identity, but rather complements the others; formed the ability to build links between phenomena, manage all kinds of resources;

2) holism, which underlies the transdisciplinary approach to learning. This approach assumes training “across”, “through” borders of many disciplines when on a joint of Sciences new Sciences and disciplines arise, there are new professions which did not exist earlier. This approach is focused on the development of emotional intelligence, especially communication skills, the ability to work in team, the ability to listen to others, analyze the situation and compromise;

3) rationalism, which involves training based on the development of cognitive abilities, the ability to perceive and analyze a large amount of information, the ability to work with a large amount of content, the skills of solving complex problems;

4) the pragmatic, development-oriented to assess the potential and/or lost profits, including economic, social, technological, etc. a Pragmatic approach also focuses on the development of skills to design, evaluate the results, assess their capabilities, first and foremost, think about the health care.

4. Conclusion
The study of technological changes in world society, occurring exponentially, justify the statement of futurologist R. Kurzweil that in 2045 there will come a time when technological progress will go beyond the capabilities of human understanding. At the same time, the development of technological progress has two trajectories: linear and exponential. The latter leads to a technological singularity. Particular attention is paid to the study of the acceleration of the reduction of the time lag between the creation of a new technology and its massification, the analysis of which showed that over a century period of time, this time gap was reduced by 37.5 times.

Exponential development of intellectual economy in the modern world, predicting the imminent onset of the moment of time, which is characterized by a singularity, requires the construction of a new model of education, which is based on the development of student’s soft skills instead of highly specialized and hard. This approach requires a review of both the structure and content of the education system, built on the principles of inter- and transdisciplinary approaches to learning.

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References

[1] Technological development of industries (Electronic Materials) Access mode: http://old.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/economydevelopment/#

[2] Bloommart T 2019 Fourth industrial revolution and business: how to compete and develop in the era of the singularity (Moscow: Alpina Publisher) p 204

[3] Schwab K and Davis N 2018 Technology of the Fourth Industrial Revolution (Moscow: Eksmo) p 320

[4] Suleimankadieva A E 2016 Theory and methodology of transformational management (Saint-Petersburg: Publishing House of SPbETU "LETI") p 168

[5] The methodology for calculating the indicators “The share of high-tech and knowledge-intensive industries in the gross domestic product” and “The share of high-tech and knowledge-intensive industries in the gross regional product of the constituent entity of the Russian Federation” (approved by order of the Federal State Statistics Service dated February 28, 2013 No. 81) (Electronic Materials) Access mode: http://www.garant.ru/products/ipo/prime/doc/70238124/#ixzz5X6ypAiV4

[6] The Russian nanotechnology market: 2011 results, 2012-2013 forecast (Electronic Materials) Access mode: https://marketing.rbc.ru/articles/5399/

[7] Lynn A 2019 Strength of emotional intelligence. How to develop it for work and life (Moscow: Mann, Ivanov and Ferber) p 320

[8] Kurzweil R 2005 The Singularity Is Near: When Humans Transcend Biology (New York: Viking) p 432

[9] Rasskazova O, Kalinina O and Zotova E 2018 Modern transformation of the production structure and its impact on the content of labor and the requirements for the skills and abilities of workers MATEC Web of Conferences: Business Technologies for Sustainable Urban Development 01041

[10] Petrov M A and Pivovarova M I 2018 Conceptual foundations of knowledge management and knowledge management systems Actual problems of sociology and management: interuniversity collection of scientific papers (Saint-Petersburg: Publishing house of SPbGEU) p 72

[11] Vasetskaya N O, Glukhov V V and Burdakov S F 2019 The Elaboration of the Model of Competences of the Research and Teaching University Staff Proceedings of 2018 17th Russian Scientific and Practical Conference on Planning and Teaching Engineering Staff for the Industrial and Economic Complex of the Region, PTES 2018 98-101

[12] Rasskazova O, Alexandrov I, Burmistrov A and Siniavina M 2019 Tools for building environmental culture in Russian companies E3S Web of Conferences Vol. 110 02020

[13] Kalinina O, Balchik E and Barykin S 2018 Innovative management neural network modelling based on logistic theory MATEC Web of Conferences 239 04021

[14] Loshkareva E 2017 Skills of the future. What you need to know and be able to in a new complex world Report Woldskills Russia (Electronic Materials) Access mode: http://arzumanyan.com.ru/files/2017/wsdoklad_12_okt_rus.pdf

[15] Pokrovskaiia N N, Petrov M A and Gridneva M A 2018 Diagnostics of professional competencies and motivation of the engineer in the knowledge economy Proceedings of the 3RD international conference ERGO-2018: Human factors in complex technical systems and environments, ERGO 2018 28-31

[16] Zhukov D, Khvatova T, Lesko S and Zaltcman A 2018 Managing social networks: Applying the percolation theory methodology to understand individuals' attitudes and moods Technological Forecasting and Social Change 129 297-307

[17] Necheukhina N S, Matveeva V S, Babbrin I A and Makarova E N 2018 Modern approaches to the educational process aimed at improving the quality of highly qualified personnel training Proceedings of 2017 IEEE 6th Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches (Science. Education. Innovations) 192-195

[18] Lysak I V 2014 Interdisciplinarity and transdisciplinarity as approaches to human research
Historical, philosophical, political and legal sciences, cultural studies and art history. Questions of theory and practice 6 134–137 (Electronic Materials) Access mode: http://irinalysak.ru/index.php/stati/mezhdistsiplinarnost

[19] Chulanova O L 2019 Competence of staff in a digital economy: the operationalization of the soft skills of the organization’s staff with orthobiotic and well-being skills The Eurasian Scientific Journal 2(11) (Electronic Materials) Access mode: https://esj.today/PDF/22ECVN219.pdf

[20] Pshenichny S P 2016 The development of human capital as the basis of competitive advantage: challenges for Russian companies Economic Sciences 12 44-47

[21] Glazyev S Y 2018 The Great Digital Revolution: challenges and prospects for the economy of the 21st century (Electronic Materials) Access mode: https://glazev.ru/articles/6-jekonomika/54923-velikaja-tsifrovajarevoljutsija-vyzovy-i-perspektivy-dlja-jekonomiki-i-i-veka

[22] Valebnikova O A, Kalinina O V and Vilken V V 2018 Human capital management by approaches of corporate governance in regional economy 5766-5771

[23] Kuporov Y Y, Avduevskaya E A and Bogacheva T V 2018 Investments in human capital: Efficiency of investments in higher education in Russia 926-940

[24] Pokrovskaiia N N, Ababkova M Y and Fedorov D A 2019 Educational services for intellectual capital growth or transmission of culture for transfer of knowledge-consumer satisfaction at St. Petersburg universities Education Sciences 9(3) 183

[25] Pokrovskaiia N N, Petrov M A and Molodkova E B 2019 Organizational Management Factors for Universities and Business Infrastructure Communication: Russian-Italian Partnership Case Proceedings of 2018 17th Russian Scientific and Practical Conference on Planning and Teaching Engineering Staff for the Industrial and Economic Complex of the Region, PTES 2018 205-208