

# *Digital model of the dairy industry of Siberia*

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**Abstract** — The studies are devoted to the currently incompletely solved both in theoretical and practical aspects problem of managing the development of the dairy industry. One of the tasks aimed at solving it is the need to develop a non-standard approach to the theoretical foundations of regulation of this industry and recommendations for its practical application. The research is based on the methodology of systematic, integrated and territorial approaches using methods of economic interpretation of the obtained results, functional and comparative analysis. Scientific novelty is the theoretical substantiation of a multi-level paradoxical model of the relationship between the parameters of the dairy industry. The paradox is the hypothesis that there is a relationship between the regulatory effect and the parameters of the dairy industry that does not have a functional relationship with it (the correlation coefficient is close to 0), through a multi-level chain of indirect relationships of parameters that have a closer relationship with the regulator and indicators that are dependent on it indirectly. To implement the proposed hypothesis, a new mechanism of action is proposed, which allowed, based on actual data taken from open sources, to develop digital models of the dairy industry in Siberia, the maximum margin of error of which does not exceed 10%. Based on the results of developing a digital model and testing its information and computer technology, it is concluded that it can be used to predict the development of the dairy industry depending on the regulatory effect in the form of the invested volume of state support funds. The proposed paradoxical theory was tested for Siberia for 2019, calculated using the proposed digital technology.

**Keywords** — *digitalization, inno-diversification approach, forecasting, regulation, dairy industry*

## I. INTRODUCTION

The agro-industrial complex as a whole and the dairy industry in particular have been and remain important sectors for the Russian economy and make a significant contribution to the country's food security. Currently, the Russian Federation is one of the leading countries in the world for the production and processing of milk, however, the productivity of the herd of dairy herd is less than 2 times lower than that of developed countries.

Constraining factors in the development of the dairy industry include the import into the country of cheaper similar products from foreign countries and, first of all, from Belarus, which is ensured by a high level of state support for producers in importing countries [1]. Therefore, in order to eliminate the underperformance of the dairy industry in Russia, it is necessary to increase the volume of state support for this industry [2]. In its turn, in order to determine the necessary level of effectiveness of such support, it is necessary to determine the mechanism of its effect on the main indicators

of the dairy industry. It is advisable to present such a mechanism in the form of a digital model.

The analysis of the state of the dairy industry in Siberia and some of its regions revealed the following trends [2]:

1. State regulation has a direct effect on the position of the dairy industry in the regions.
2. Improving the efficiency of production in the industry is primarily possible by improving the digitalization system, which can significantly increase the productivity of the dairy herd.
3. Improving the system of digitalization of state regulation poses the challenges of developing information and communication technologies (ICT), allowing to model and predict the effectiveness of regulatory effects.

For the development of ICT, it is necessary to develop various software and, above all, the mathematical one.

## II. RESEARCH METHODOLOGY

The research is based on the methodology of a systematic, integrated and territorial approaches using methods of economic interpretation of the obtained results, functional and comparative analysis. Given the impossibility of establishing a direct linear relationship between most of the indicators characterizing the dairy industry, an attempt was made to apply a inno-diversification approach to solve the problem [3]. The inno-diversification approach to regulating the parameters of the dairy industry is justified primarily by the complexity and variety of the development of the production processes in the production of milk, its processing into dairy products and their sale to consumers. These processes are multidimensional and diverse, like most production and economic processes and phenomena..

The inno-diversification approach provides a new understanding of the processes in the dairy industry. The main principle of the inno-diversification approach to regulating the dairy industry is the combination of a systematic approach (regulatory and stimulating effects) and non-linear dynamics methods (randomness of events, unpredictable behavior). The synergistic effect of the inno-diversification approach does not occur immediately, but with a time delay. It is traditionally accepted to evaluate the annual effect. Therefore, after a year has passed since the regulatory effect, depending on its strength and direction, the formal model should adjust its indicators and automatically, gradually adapt to changing conditions. Thus, after the expiration of the calendar year, the model is adjusted and indicators for the next period should be forecasted taking into account these changes.

A hypothesis has been made that the inno-diversification approach will allow to take into account the direct relationship

between the parameters, where possible, and the indirect one, where such a relationship cannot be established. The proposed hypothesis, called the paradoxical theory of regulation, assumes the existence of a multi-level model that could describe with sufficient accuracy the interaction of parameters characterizing such a diverse industry as the dairy one.

To confirm the hypothesis on the basis of the innovativeness approach, it is proposed to test it on the actual data of the work of the dairy industry in Siberia for at least a five-year period of time.

### III. RESEARCH RESULTS

To develop a digital model, it is necessary to determine the possible parameters that characterize the dairy industry, and approaches that allow formalizing the processes taking place in it. As parameters of the formalized model, using ranking methods and economic interpretation, 15 main industry indicators [4-5] were outlined in Table 1, covering all areas of the dairy industry:

- X1 Milk production in farms of all categories, thousand tons;
- X2 Production of marketable milk, thousand tons;
- X3 Livestock of cows in farms of all categories at the end of the year, thousand animal units;
- X4 Livestock of cows at the end of the year in the agricultural organizations, peasant farms, private subsidiary farms, thousand animal units;
- X5 Proportion of brood cows in the agricultural organizations, peasant farms, private subsidiary farms, %;
- X6 Proportion of brood cows of milk and mixed production, %;
- X7 Milk production of cows in farms of all categories, kg/year;
- X8 Milk production of cows in agricultural organizations (AO), kg/year;
- X9 Milk production of cows in peasant farms (PF), kg/year;
- X10 Milk production of cows in private subsidiary farms (PSF), kg/year;
- X11 Milk production of brood cows, kg/year;
- X12 Production of milk and dairy products per capita, kg/year;
- X13 Consumption of milk and dairy products per capita, kg/year;
- X14 Milk processing and production of dairy products recalculated as milk, tons;
- X15 Volume of state support funds for the dairy industry, mln. RUR.

The names given for the analysis of the main indicators of the dairy industry are taken from open sources [4-5], and designations are introduced for formal description and manipulation in mathematical models. As is common in most studies, indicators were designated by the Latin symbol X and a numeric character defining the number in the order listed.

As initial data for studies, Table I was formed with initial data for further correlation, regression, interpretation and other types of analysis.

TABLE I. DE-IDENTIFIED VALUES OF INDICATORS CHARACTERIZING THE DAIRY INDUSTRY OF SIBERIA

Designation of parameters	Analyzed time periods in years				
	2014	2015	2016	2017	2018
X1	6584,9	4839,9	4748,3	4812,3	4861,3
X2	2787,6	2807,4	2893,5	3088,6	3198,3
X3	1441,7	1423,9	1409,0	1410,4	1396,9
X4	706,3	707,2	723,0	733,2	737,0
X5	19,9	19,7	19,9	20,8	19,7
X6	18,0	16,0	16,0	17,2	17,1
X7	3416,5	3492,8	3514,4	3624,1	3693,2
X8	3776,1	3949,4	4188,1	4359,8	4454,6
X9	2343,9	2157,0	2189,0	2258,3	2297,2
X10	3236,4	3020,6	3199,6	3223,3	3219,2
X11	5501,9	5135,0	5439,3	5479,6	5472,6
X12	186,9	184,4	185,9	184,7	184,2
X13	256,8	253,0	249,8	247,1	244,8
X14	3219,3	3352,0	3037,6	3001,7	3018,5
X15	2865,4	2573,9	4027,9	3896,2	3104,3

The values of indicators characterizing the dairy industry of Siberia were formed as total indicators for 10 constituent entities of the federation [4-5].

In Table I the values of indicators (absolute and relative) are given de-identified, but in their strict accordance with the names and dimensions given in the introduction. The analysis is based on data from the last five years..

To determine the possible relationship between the indicators (Table I), a correlation analysis was carried out, which made it possible to establish not only the relationship between the main indicators of the dairy industry, but also its proximity to a linear form. Results of the correlation analysis for 2014–2018 showed a large spread of multidirectional correlation coefficients (R):

- positive from 1 to 0,03.
- negative from -0,12 to -1.

A fundamentally significant spread in the correlation coefficients indicates that there is no linear, as well as no unambiguous relationship between the parameters of the dairy industry, although there is a linear relationship between its individual indicators. Therefore, using traditional methods, it is not possible to establish the relationship between the parameters.

As a result of the a priori research, a four-level model (Fig. 1) of the influence of the controlling parameter of state regulation (the amount of state support funds for the dairy industry) on the quantitative and qualitative indicators of the Siberian industry was proposed.

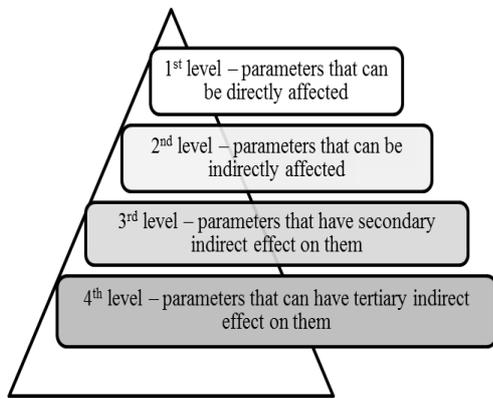


Fig. 1. The four-level model of the relationship between the parameters of the dairy industry

The first level (direct effect) includes six indicators (livestock of cows at the end of the year in agricultural organizations, peasant farms, proportion of brood cows in agricultural organizations, peasant farms, milk production of cows in agricultural organizations, milk production of cows in private subsidiary farms, the milk production of brood cows, milk processing and production of dairy products recalculated as milk). This indicates that the regulator stimulates not only a quantitative increase in the herd from emphasis on brood cows, but also on a qualitative increase in its milk productivity.

The second level (indirect effect) includes five indicators (production of marketable milk, livestock of cows in farms of all categories at the end of the year, milk production of cows in farms of all categories, consumption of milk and dairy products per capita, milk production of cows in agricultural organizations), which the regulator does not have a direct strong effect on, but they are strongly affected by indicators of the first level and, in the first place, livestock of cows at the end of the year in agricultural organizations, peasant farms.

The third level (secondary indirect effect) includes two indicators (production of marketable milk and Production of milk and dairy products per capita), which are almost independent of the regulator (correlation coefficient -0.46 and 0.09) and indicators of the first level (coefficient correlations are -0.57 and -0.52) and have a multidirectional manifestation vector. They have a strong interdependence with only some indicators of the second level. In particular, they are most dependent on the livestock of cows in farms of all categories at the end of the year (correlation coefficient over 0.81 and 0.69).

The fourth level (tertiary indirect effect) includes two indicators (proportion of brood cows of milk and mixed production, milk production of cows in peasant farms), which are almost independent of the regulator (correlation coefficient -0.13 and -0.11), indicators of the first level (correlation coefficient 0.04 and -0.52) and indicators of the second level (correlation coefficient 0.37 and -0.53) and have a multidimensional manifestation vector. They have a strong interdependence only with the third level indicator. In particular, they are most dependent on milk production in

farms of all categories (correlation coefficient over 0.75 and 0.71).

The final results of multilevel correlation and regression analyzes are shown in Table II.

TABLE II. INTERDEPENDENCE BETWEEN THE VOLUME OF FUNDS OF STATE SUPPORT OF THE DAIRY INDUSTRY OF THE NOVOSIBIRSK REGION AND ITS MAIN INDICATORS

Designation	Digital model	R	Margin of error, %
1 <sup>st</sup> level	Direct effect		
X4	$X4 = 0,01344 * X15 + 677,067$	0,60	1,5%
X5	$X5 = 0,000438 * X15 + 18,5237$	0,62	2,6%
X8	$X8 = 0,2447 * X15 + 3339,637$	0,56	8,0%
X10	$X10 = 0,0754 * X15 + 2931,437$	0,54	9,1%
X11	$X11 = 0,1282 * X15 + 4983,443$	0,54	3,5%
X14	$X14 = -0,1965 * X15 + 3772,959$	-0,82	4,8%
2 <sup>nd</sup> level	Indirect effect		
X2	$X2 = 12,144 * X4 - 5804,95$	0,96	3%
X3	$X3 = -1,07368 * X4 + 2190,875$	-0,90	1%
X7	$X7 = 7,2126 * X4 - 1654,542$	0,94	2%
X8	$X8 = 19,3645 * X4 - 9822,869$	0,98	3%
X13	$X13 = -0,321 * X4 + 481,869$	-0,96	1%
3 <sup>rd</sup> level	Secondary indirect effect		
X1	$X1 = 38,199 * X3 - 48934,5$	0,81	5,3%
X12	$X12 = 0,0458 * X3 + 120,508$	0,69	0,8%
4 <sup>th</sup> level	Tertiary indirect effect		
X6	$X6 = -0,000822 * X1 + 12,587$	0,76	4,1%
X9	$X9 = 0,0683 * X1 + 1895,828$	0,71	3,2%

Table II shows that the margin of error of the obtained mathematical equations does not exceed 8%, which indicates the possibility of using the proposed mathematical apparatus as a mechanism for predicting the effects of state regulation on the main indicators of the dairy industry in Siberia. The margin of error is related to the risks of the digital economy [6-11]

Checking the adequacy of the digital model in comparison with the actual data for the previous 5 years (Table III-IV) showed that with the smallest relative deviation (less than 3.2%), the last indicator in the algorithm **X9** (milk production of cows in peasant farms) is calculated, and with the highest (slightly less than 9.1%) - **X10** (milk production of cows in private subsidiary farms).

To develop an ICT that implements a paradoxical model for regulating the dairy industry, it is necessary to build an algorithm based on formulas in the form of mathematical support for digital technology, shown in Table II.

As initial data (Table I) for subsequent calculations, the proposed algorithm proposes to use a regulatory tool, by controlling which we can achieve the necessary indicators for the dairy industry. It is proposed to use the volume of state support funds for the dairy industry (**X15**) as a regulatory effect.

TABLE III. CORRECTNESS CHECK OF THE DIGITAL MODEL BASED ON THE ACTUAL DATA FOR 2018

Designation	Calculation	Fact	Absolute deviation	Relative deviation	Margin of error of formula
X15	3104,3	3104,3	0,0	0,00%	0,00%
1 <sup>st</sup> level					
X4	718,8	737,0	-18,2	-2,47%	2,47%
X5	19,9	19,7	0,2	1,08%	-1,08%
X8	4099,3	4454,6	-355,3	-7,98%	7,98%
X10	2931,5	3219,2	-287,6	-8,94%	1,67%
X11	5381,4	5472,6	-91,2	-1,67%	1,67%
X14	3163,0	3018,5	144,5	4,79%	-4,79%
2 <sup>nd</sup> level					
X2	2924,2	3198,3	-274,1	-8,57%	1,67%
X3	1419,1	1396,9	22,2	1,59%	-0,19%
X7	3529,8	3693,2	-163,3	-4,42%	0,87%
X8	4096,3	4454,6	-358,3	-8,04%	0,14%
X13	251,1	244,8	6,3	2,59%	-0,20%
3 <sup>rd</sup> level					
X1	5014,6	4861,3	153,3	3,15%	8,98%
X12	185,5	184,2	1,3	0,69%	-0,14%
4 <sup>th</sup> level					
X6	16,9	17,1	-0,1	-0,73%	2,73%
X9	2224,1	2297,2	-73,2	-3,18%	3,01%

TABLE IV. CORRECTNESS CHECK OF THE DIGITAL MODEL BASED ON THE ACTUAL DATA FOR 2014-2018, FOR PARAMETERS WITH MINIMUM AND MAXIMUM DEVIATIONS

Designation	2014	2015	2016	2017	2018
X10	-9,42%	-2,95%	-8,38%	-9,05%	-8,94%
X9	0,23%	3,11%	1,60%	-1,51%	-3,18%

After checking the correctness of the input data, ICT proceeds to the analysis and calculation of indicators of direct effect of the first level: **X4, X5, X8, X10, X11, X14**. Having calculated the named parameters and placing their database, the algorithm proceeds to the next step.

At the second step, the indicators of the indirect effect of the second level are calculated, based on the results of the calculation of the most significant parameters of the direct effect of the first level (**X4**). At this step, nine indicators are calculated: **X2, X3, X7-X8** and **X13**, which become the source data for the third calculation step.

In the third step, using parameter **X3**, the indicators are calculated: **X1** and **X12**, and in the fourth step, using parameter **X1**, the resulting indicators **X6** and **X9** are calculated. At the final step, the calculation results are placed in a database and can be transferred to interested users of ICT in electronic or paper form.

The digital technology algorithm for predicting the results of regulation of the parameters of the dairy industry in Siberia is shown in Figure 2.

#### IV. THE DISCUSSION OF THE RESULTS

Digital technology developed on the basis of the innovativeness approach enables authorities to form intersectoral relationships in the dairy industry. The effective formation of intersectoral mutual relations becomes possible

due to the technical infrastructure of the state regulation processes of the dairy industry digitalization.

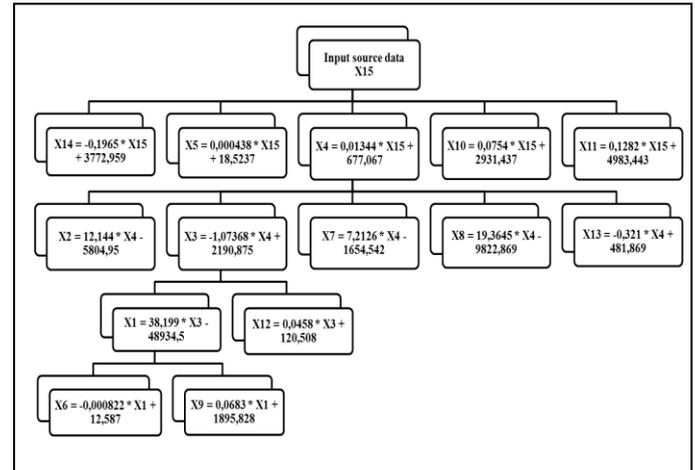


Fig. 2. The digital model algorithm

In order to forecast milk production and performance indicators of the dairy industry in the region, we will calculate the forecast for the development of Siberia in the near future, provided that the amount of state support remains at the same level. The results of such forecasting for a scenario that preserves the volume of state support at the current year level, according to the algorithm presented in Figure 2, are shown in Table V.

TABLE V. FORECASTING OF THE MAIN INDICATORS OF THE DAIRY INDUSTRY OF SIBERIA, DEPENDING ON THE VOLUME OF STATE SUPPORT

Designation	Fact 2018	Predictio-n for 2019	Absolute deviation	Relative deviation
X15	3104,3	3104,3	0,0	0
1 <sup>st</sup> level				
X4	737,0	718,8	-18,2	-2,47%
X5	19,7	19,9	0,2	1,08%
X8	4454,6	4099,3	-355,3	-7,98%
X10	3219,2	2931,5	-287,6	-1,67%
X11	5472,6	5381,4	-91,2	-1,67%
X14	3018,5	3163,0	144,5	4,79%
2 <sup>nd</sup> level				
X2	3198,3	2924,2	-274,1	-8,57%
X3	1396,9	1419,1	22,2	1,59%
X7	3693,2	3529,8	-163,3	-4,42%
X8	4454,6	4096,3	-358,3	-8,04%
X13	244,8	251,1	6,3	2,59%
3 <sup>rd</sup> level				
X1	5014,6	153,3	412,6	3,15%
X12	184,2	185,5	1,3	0,69%
4 <sup>th</sup> level				
X6	17,1	16,9	-0,1	-0,73%
X9	2297,2	2224,1	-73,2	-3,18%

It is seen from Table V that the volume of state support funds, which is defined as the sum of the volumes allocated to the regions, is generally insufficient in the region. Current funding is likely to lead to a slight increase in the five parameters under consideration and to a decrease in the eight of them. Despite the expected quantitative increase in milk

production in the agricultural sector by 3.15%, its qualitative indicator of marketable milk decreased by 8.6%. This is due to a possible decrease in the number of cows in agricultural organizations and peasant farms by 2.5%, despite its growth in farms of all categories by 1.6%, a decrease in the proportion of brood cows of milk and mixed production by 0.7%, despite an increase in their proportion in agricultural organizations and peasant farms by 1%, and mainly due to a drop in milk production from 1.7% to 9%. However, a quantitative increase in milk production by 3.15% will contribute to an increase in the industrial sector in milk processing and production of dairy products recalculated as milk by 4.8%, production of milk and dairy products per capita by 0.7% and related to them service sector indicator – consumption of milk and dairy products per capita by 4.8%.

## V. CONCLUSION

Based on the proposed theory of paradoxical regulation, a mechanism of action was developed that allowed, using actual data taken from open sources, to develop digital models of the dairy industry in Siberia.

An algorithm is substantiated based on the formulas in the form of mathematical support for digital technology for regulating the parameters of the dairy industry in Siberia, obtained by the method of inno-diversification approach.

It is proposed to use a regulatory tool in the form of state support as the source data in the proposed algorithm, managing which you can achieve the necessary indicators of the dairy industry.

After checking the correctness of the input data, ICT proceeds to the analysis and calculation of indicators of direct effect of the first level. Having calculated the named parameters and placing their database, the algorithm proceeds to the next step.

At the second step, the indicators of the indirect effect of the second level are calculated, based on the results of the calculation of the most significant parameters of the direct effect of the first level. At this step, indicators that become the source data for the third calculation step are calculated.

At the third step, using the most significant parameters of the second step, the parameters of the secondary indirect effect of the third level are determined, and at the fourth step, using the most significant parameters of the third step, the final indicators are determined.

At the final step, the calculation results are placed in a database and can be transferred to interested users of ICT in electronic or paper form.

Furthermore, their maximum margin of error does not exceed 10%. Based on the results of developing a digital model and testing its ICT, it can be concluded that it can be used in predicting the development of the dairy industry in Siberia depending on the regulatory effect in the form of the invested volume of state support funds.

A direct forecast of indicators of the dairy industry in the region has been developed. In contrast to existing developments, the forecast is based on the use of not only a temporary factor, but also the volume of state support funds in three scenarios of the industry's development: pessimistic, expected and optimistic.

A reverse forecast has been developed for the necessary volumes of state support to achieve the targeted indicators for the dairy industry at any level of effect.

The proposed inno-diversification approach should be applied not separately, but in combination with simulation modeling of the scenario approach [12].

Testing the construction of digital models for dairy organizations based on additional digital models for the regions should be considered as well.

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## References

- [1] Strategiya razvitiya pishchevoy i pererabatyvayushchey promyshlennosti Novosibirskoy oblasti na period do 2025 goda [The development strategy of the food and processing industry of the Novosibirsk region for the period until 2025].- 48 p.
- [2] Chernyakov M.K. Molochnaya industriya kak strategicheskoye napravleniye razvitiya rynka prodovol'stviya [Dairy industry as strategic direction of development of the market of food] / M.K. Chernyakov, M.M. Chernyakova // Pishchevaya promyshlennost' [Food industry]. - 2018. - № 4. - pp. 33–37.
- [3] Chernyakov M.K. Innodiversification model of the digital economy of the agricultural sector / M.K. Chernyakov, M.M. Chernyakova, K.Ch. Akberov // Advances in Social Science, Education and Humanities Research. - 2019. - Vol. 240 : SICNI 2018.- pp. 262-267. - DOI: 10.2991/sicni-18.2019.114.
- [4] Molochnaya otrasl'-2018-2019: [spravochnik] [Dairy industry-2017 [encyclopedia]]. Belov A.S., Voronin A.A., Zhebit M.E., et al. Moscow, Natsional'nyy soyuz proizvoditeley moloka, 2017, 388 p.
- [5] Molochnaya otrasl'-2017: [spravochnik] [Dairy industry-2017 [encyclopedia]]. Belov A.S., Voronin A.A., Zhebit M.E., et al. Moscow, Natsional'nyy soyuz proizvoditeley moloka, 2017, 380 p.
- [6] Chernyakov M.K. Klassifikatsiya riskov tsifrovoy ekonomiki [Risk Classification of the Digital Economy] / M.K. Chernyakov, M.M. Chernyakova // Financial economics, №3 (part 3).– pp.384–389.
- [7] Chernyakov M. K. Riski razvitiya tsifrovoy ekonomiki [The risk of development of the digital economy] / M.K. Chernyakov, M.M. Chernyakova, K.Ch. Akberov // Menedzhment i predprinimatel'stvo v paradigme ustoychivogo razvitiya [Management and Entrepreneurship in the Sustainable Development Paradigm (MESDP-2018) : materials of 1 internat. scient. conf., Ekaterinburg, 24 May 2018 – Ekaterinburg, 2018. – part 2. – pp. 198–202.
- [8] Chernyakov M.K. Technological Risks of the Digital Economy / Mikhail K. Chernyakov, Maria M. Chernyakova // Journal of Corporate Finance Research, 2018 | Vol. 12 | # 4. – pp. 99–109. e-journal: www.cfjournal.hse.ru.
- [9] Chernyakov M.K. Innovatsionnyye riski tsifrovoy ekonomiki [Innovative risks of digital economy] / M.K. Chernyakov, M.M. Chernyakova // Natsional'nyye priority Rossii. Seriya 1: Nauka i voennaya bezopasnost' [National priorities of Russia. Series 1: Science and military security], 2018, № 4 (31). – pp. 63–68.
- [10] Chernyakov M.K. Dynamic model of social risks in the digital economy / M.K. Chernyakov, M.M. Chernyakova, K.Ch. Akberov // Advances in Economics, Business and Management Research. - 2019.– Vol. 81: Modern Management Trends and the Digital Economy: from Regional Development to Global Economic Growth: 1 intern. sci. conf. (MTDE 2019).– pp. 373–378.
- [11] Chernyakov M.K. Psikhologicheskiye riski tsifrovoy ekonomiki [Psychological risks of the digital economy] / Voprosy razvitiya sovremennoy nauki i praktiki v period stanovleniya tsifrovoy ekonomiki [Issues of the development of modern science and practice during the

formation of the digital economy] / materials of internat. scient. conf. – St. Petersburg, 2018. – 299 p. – pp. 257-289.

[12] Chernyakov M.K. Simulation design of manufacturing processes and production systems / M. K. Chernyakov, M. M. Chernyakova, K. C.

Akberov // Advances in Engineering Research. - 018. – Vol. 157: Actual issues of mechanical engineering, AIME 2018, Novosibirsk, 19–21 April 2018. –pp. 124-128.