Economic and Statistical Modeling of Interaction with Behavioral and Resulting Indicators of Labor Activity of Industrial Enterprises in the Aspects of Improving Efficiency of their Functioning

Mykhailo Vedernikov
Department of Personnel Management and Labour Economics
Khmelnytsky National University
Khmelnitsky, Ukraine
liberty_lvs@ukr.net,
http://orcid.org/0000-0002-9850-3575

Natalia Bazaliyska
Department of Personnel Management and Labour Economics
Khmelnytsky National University
Khmelnitsky, Ukraine
n_bazaliyska@ukr.net,
http://orcid.org/0000-0001-5230-1727

Lesia Volianska-Savchuk
Department of Personnel Management and Labour Economics
Khmelnytsky National University
Khmelnitsky, Ukraine
liberty_lvs@ukr.net,
http://orcid.org/0000-0002-4043-9312

Oksana Chernushkina
Department of Personnel Management and Labour Economics
Khmelnytsky National University
Khmelnitsky, Ukraine
Chernushkina_OO@meta.ua

Abstract — **The paper deals with the problems of quantify the impact of behavioral indicators of staff employment on the performance of industrial enterprises using economic and statistical modeling of their relationship. The proposed scientific and methodological approach to increase the efficiency of production systems of industrial enterprises provides step-by-step introduction: 1) formation of a complex of behavioral indicators of activity efficiency; 2) establishment of multiple correlation between the factor-behavioral and productive signs of industrial production efficiency by the method of statistical dependence equations; 3) identifying the most important behavioral indicators of the activity of enterprises by rating the cumulative impact of the main factors of labor activity; 4) forecasting the efficiency of enterprises' activity, taking into account the dynamics of behavioral indicators. From the practical point of view, the conducted research makes it possible to simulate the influence of the main economic indicators of the functioning of industrial enterprises on the value of a universal, generalizable, effective indicator of the efficiency of their activity, which opens economic prospects of regulation and increase of labor productivity due to the regulation of labor indicators of industrial and economic activity of enterprises.**

Keywords — Personnel behavior, personnel management, economic and statistical modeling of the relationship between behavioral and performance indicators of personnel work; analysis of parameters and estimates of single-factor and multiple dependencies.

I. INTRODUCTION

Domestic industrial enterprises are currently in an extremely unstable financial and economic situation and only those who are able to support the efficiency of economic activity at a high level, provide high quality products and use new innovative approaches to the organization of the enterprise management system are able to survive. Economic and statistical study of the interconnection of behavioral and effective performance indicators of an enterprise, their forecasting and modeling performs an important analytical function, since stabilization the financial strength of an industrial enterprise is an important factor in ensuring its strategic development, strengthening its competitiveness and increasing the attractiveness of innovations.

II. ANALYSIS OF LITERARY DATA AND PROBLEM STATEMENT

O. Gastev, director of the Central Institute of Labor, unlike the classics of the scientific organization of labor F. Taylor and G. Ford, has always emphasized the leading role of the human factor in the overall efficiency of production. Therefore, consideration of organizational effectiveness begins with O. Gasteva on the individual effectiveness of a particular person. This approach is called "narrow base" (the basis for improving the efficiency of production is the personal (narrow) efficiency of the individual) [1, p. 210]. Thus, an increase in the economic performance of an enterprise is impossible without taking into account the influence of behavioral characteristics of production activity on them.

The first models of measuring and evaluating the efficiency of the enterprise began to appear in the 20's of the XX century. F. D. Brown [2, p. 270-274] deduced the mathematical relationship between the estimated coefficients of the company's performance evaluation: profitability of sales, resource returns and return on assets. A significant place among the methods of statistical study of the relationship between social and economical phenomena and processes belong to the method of statistical indices. Authors [3, p. 139-141] offer to distinguish two functions of the indices: "synthetic, associated with the construction of

general characteristics of dynamics or spatial comparisons and analytical, aimed at studying the laws of dynamics, relationships between indicators, structural shifts". The scientist [4] notes that one of the areas of statistical study of interrelations is the simulation and forecasting of the dynamics of social and economic phenomena and processes. The model establishes the correspondence between a set of factors and hypotheses, simulating the mechanism of formation of regularities. It can't be argued that existing research of production systems completely ignores behavioral variables, but they are often used noneleologically, that is, they do not fully take into account all behavioral characteristics of production activity. The combination of behavioral performance indicators with economic performance indicators will allow to take into account both economic and social and behavioral ways to optimize the production process. So, in support of this, we give the statement of A. Kochetkova [5, p. 146-147]: "The practical use of the achievements of the behavioral economy is the conscious application of its conceptual statistical models for improving the qualitative and quantitative indicators of human productive activity and the efficiency of the enterprise". Consequently, the efficiency of the operation of an enterprise should be determined by a combination of both economic and behavioral indices of production activity. To this end, it is necessary to form a complex system of indicators, which in a generalized way reflects the analysis of economic performance, taking into account the influence of behavioral variables on them.

III. Purpose and Objectives of the Research

The aim of the work is to build a mechanism for improving the efficiency of the functioning of industrial enterprises by means of forming statistical models of the relationship between behavioral and productive indicators of production activity. It will make possible to determine the most important behavioral indicators of production activity, which have the greatest influence on the average annual output, and predict the growth of the effective indicator on the basis of establishing the normative levels of each factor for direct linear and inverse dependence.

To achieve this goal, the following tasks were solved:

1) to build a mechanism for increasing the efficiency of the functioning of industrial enterprises;

2) to carry out the classification of heterogeneous behavior indicators of influence on the results of activities of industrial enterprises;

3) to establish the form and type of multiple dependence of behavioral and effective indicators of production activity of enterprises;

4) to carry out the economical and statistical modeling of the influence of behavioral indicators of production activity on the efficiency of the functioning of the industrial enterprise;

5) to evaluate the dependencies between the results and factors of the statistical dependence equations;

6) to confirm the existence of a stable relationship between behavioral and performance indicators of industrial enterprises and to predict the change in the effectiveness of its operation in the future.

IV. Materials and Methods of Research

The introduction of new methods of statistical research is an indicator of the financial development of an industrial enterprise. The methodological foundations of the statistical analysis of the relationship between behavioral and performance indicators of the enterprise are formed on the basis of the existing statistical methodology and the corresponding system of indicators [6, p. 62-63].

The method of statistical equations of dependencies is intended for selection of the best equation of single-factor dependence and further modeling and forecasting on the basis of the initial data of variational or dynamic series [7, p. 15-18]. The method allows to choose the best function of one-line dependence, its graphic image and on this basis, simulation and forecasting.

The use of statistical equations of dependencies for analyzing the relationships between economic indicators requires [7]:

1) qualitative analysis of the investigated factor and performance characteristics which implies the existence of a logical relationship between these features;

2) homogeneity of the investigated indicators, that is, the exclusion from the calculation of the values of the sign (minimum or maximum), which differ (2-3 times), according to the magnitude of the next, or the one preceding the maximum value;

3) assessment of the stability of the relationship between the indicators, which are established by the degree of approaching the dependence studied, to a definite form of the equation, expressed by the appropriate form of communication (direct, hyperbola, parabola).

Depending on the form of the relationship of the multiple dependence 30 and the coefficient of stability of the relationship, it is necessary to choose the appropriate statistical equation of the dependence of the resultant feature on factor indicators. This will take into account the availability of different forms of interconnection [8, p. 136]. Determining the type of function and type of relationship plays a decisive role, since it depends on whether the applied equation reflects the essence of the relationship between the resultant and the factors. The criterion for choosing a better equation of dependence is to compare the values of the coefficient of stability of the relationship (Table 1) [8, p. 134]. The presence of stable dependence proves the reliability of the parameters of the equation of dependence, which makes it possible to use them when carrying out normative and predictive calculations.

TABLE I. Scale of estimation of dependencies between productive and factor indicators

Evaluation criterion	Coefficient of communication stability
Unstable connection	
Very Low	to 0.5
Low	from 0.5 to 0.6
Noteworthy	from 0.6 to 0.7
Stable connection	
Midium	from 0,7 to 0,8
High	from 0,8 to 0,9
Very high	from 0,9 and higher

To calculate the parameters of one-line linear direct and inverse relationship of the investigated factors we use [8, p. 92]: a) the direct:

$$y_x = y_{e,max}\left(1 - bd_{1-\frac{x_i}{x_{max}}}\right),$$

b) the inverse:

$$y_x = y_{e,max}\left(1 - bd_{\frac{x_i}{x_{min}}-1}\right).$$

where y_x is the theoretical (estimated) value of the resultant trait; $y_{e,max}$ is maximum empirical value of the resultant trait; b is parameter of the equation of one-element dependence; d is symbol of the magnitude of deviations of the coefficient of comparison of the factor characteristic; x_i is the value of a factor characteristic for the i period; x_{max} and x_{min} are the maximum and minimum empirical value of the factor trait.

To assess the stability of the connection between the factor indicators and the resultant indicator, the corresponding coefficient for each single-factor equation is also calculated [8, p.116]:

$$K = 1 - \frac{\sum|d_y - bd_x|}{\sum d_y},$$

where d_y is the magnitude of deviations of the coefficient of comparison of the empirical values of the resultant trait; bd_x is the magnitude of the deviations of the coefficient of comparison of the theoretical values of the resultant trait.

Calculation of the statistical equation of the dependencies of the normative values of the factors to ensure the process of growth of the values of the effective indicator with the orientation towards achieving a given annual rate of growth at the level of 7% (d_{yH}) involves the establishment of normative levels of each factor for direct linear and inverse dependence [8, p. 148]:

a) for direct linear dependence of LPZ No. 2:

$$x_H = \left(1 - \frac{d_{yH}}{b_x}\right)x_{2020},$$

Given the fact that there is a combinational linear relationship between the resultant indicator and the calculations made by the main indicators of its formation, the equation of multi-factoral combination dependence must be applied, the parameters of which are calculated by the formula 6 for KMLZ No. 2 [8, p. 300-304]:

$$y_{x_{i=\overline{1,n}, \ j=\overline{1,m}}} = y_{e,max}\left[1 - B \times \left\{\sum_{j=1}^{m} d_{1-\frac{x_{ji}}{x_{j max}}} + d_{\frac{x_{ji}}{x_{j min}}-1}\right\}\right],$$

Where $y_{xi=1,n,j=1,m}$ is the theoretical value of the resultant characteristic, determined by the equation of multiple linear linear dependence (with "and" the set of observations and "j" the number of factors); $y_{e,max}$ is

maximum value of the resultant trait; B is the collective parameter of multi-agent dependence; d is sign of the magnitude of deviations of the coefficient of comparison of the investigated factor; $x_{j,i}$ is actual values of the factors included in the calculations; x_{jmax} and x_{jmin} are respectively, the actual maximum and minimum values of factor characteristics included in the calculations.

We can set the particle effects of each of the factors included in the calculation (Δ_{xi}) by the magnitude of the resultant characteristic [8, p.181]:

$$\Delta x_{j \ i=\overline{1,n}, \ j=\overline{1,m}} = \frac{\sum_{i=1}^{n} d_{x_{ji}}}{\sum_{j=1}^{m}\sum_{i=1}^{n} d_{x_{ji}}}$$

The calculation of the complex factor of weighting deviations from their maximum and minimum values. The formula consists of two parts, one of which is used for indicators of stimulants, and the other - for disintegrators:

$$K_в = \sum \frac{x_{max} - x_i}{x_{max} - x_{min}} + \sum \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

Where $K_в$ is complex coefficient of deviation of the values of the characteristics of the object of research; x_i is the value of an expert assessment of the characteristics of the object of research; x_{jmax} and x_{jmin} are respectively, the minimum and maximum value of the expert assessment of the characteristics of the research object.

In contrast to the mathematical method of correlation and regression analysis, the basis of which is linear algebra, the application of the method of statistical equations of dependencies is based on the calculation of the comparison coefficients, which are determined by the ratio of separate values of the same sign to their minimum or maximum level [9, p. 121].

V. ECONOMIC AND STATISTICAL MODELING OF THE RELATIONSHIP OF BEHAVIORAL AND EFFECTIVE INDICATORS OF PRODUCTION ACTIVITY AND THEIR IMPACT ON THE EFFICIENCY OF THE FUNCTIONING OF INDUSTRIAL ENTERPRISES

The integrated system of behavioral indicators of production activity should take into account the whole set of indicators that characterize the efficiency of labor potential use. Accordingly, all indicators are grouped into 4 groups: the number and staff turnover; personnel structure; use of working time; the effectiveness of the behavior of thr personnel [10, p. 28]. To establish the relationship and simulate the influence of factors of labor activity on the performance indicator, we apply the method of statistical equations of dependencies [11, p. 101].

The use of statistical equations of dependencies as a method of quantitative assessment of the relationship between the resultant sign and behavioral, factor indicators allows solving important tasks in determining the basic reserves of increasing productivity.

The next stage is the calculation of behavioral indicators of production activity of enterprises. Minimization of deviations of the empirical valuesof the effective

characteristic from its theoretical values in the application of a computer program is automatically overcome all forms and directions of communication with the choice of the type and direction of communication, which provides a minimum amount of deviations. Therefore, with the use of the programm"Method of statistical equations of dependence", a better function of the investigated interconnection for an industrial enterprise (Table 2) was determined based on the principle of the presence of multiple factors in a multiplicity model.

TABLE II. THE CHOICE OF FORM AND TYPE OF MULTIPLE DEPENDENCE BETWEEN THE PRODUCTIVE AND BEHAVIORAL INDICATORS OF PRODUCTION ACTIVITY

Name of the function	Symbol of the function	Formula	Coefficient of connection stability	Factor number	Factor symbol
Parabola	M_ parabola	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{(x_i,x_0)}{x_i}\cdot\frac{(x_i,x_0)}{x_i}-1}+d_{1-\frac{(z_i,z_0)}{z_i}\cdot\frac{(z_i,z_0)}{z_i}-1}\right)\right]$	0.871	3	x_6, x_{19}, x_{30}
Combinational hyperbolic connection	CMHC No. 2	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{1}{x_i}\cdot\frac{1}{x_{max}}}+d_{1-\frac{1}{z_{min}}\cdot\frac{1}{z_i}}\right)\right]$	0.712	3	x_{25}, x_{26}, x_{30}
Combinational logical connection	CMLOGC No. 1	$y_{xz} = \dfrac{1}{\dfrac{1}{y_{min}}-B\left(d_{1-\frac{1}{x_{min}}\cdot\frac{1}{x_i}}+d_{1-\frac{1}{z_i}\cdot\frac{1}{z_{max}}}\right)}$	0.857	3	x_{11}, x_{25}, x_{30}

Using the method of statistical equation of dependence, the presence of multiple interconnections is maximally determined for the three factors of the formation of the level of the effective indicator. Since the value of the coefficient of stability of the connection of the combination hyperbolic connection (CMGC number 2) is less than two other functions, see Table. 2, then it would be logical to assert that it is necessary to consider the choice of a better function between the parabolic and the logical plural interconnection [12, p. 135].

By the criterion of the minimum amount of linear deviations between the empirical and theoretical values of the resultant characteristic and the stability of communication, for each industrial enterprise the best function is chosen (Table 3), which takes into account the influence of the three most influential indicators of labor activity of personnel, such as: x11 x25 та x30.

By identifying the direction of the pair relationship between the investigated factors and the resultant parameter for a parabolic function, we come at the conclusion that the function of the combinational logical connection must be considered. Since the parabolic plural function does not fully characterize the direction of the pair with the resultant attribute (the factor "x6" is a reverse dependence, "x19" is an inverse relationship, "x30" is a direct dependence), therefore it is more appropriate to use the function of the combination logical connection, which reflects fully the direction of the pair ties that are included in it (the factor "x11" is a direct dependence, "x25" is an inverse relationship, "x30" is a

direct dependence). To calculate the parameters of one-line linear direct (factors with numbers 11 and 30) and the inverse (factor x25) interrelation of the investigated factors, the corresponding formulas of the method of statistical equations are used (Table 4).

TABLE III. RESULTS OF THE CHOICE OF THE FUNCTION OF MULTIPLE DEPENDENCE ACCORDING TO THE SURVEYED INDUSTRIAL ENTERPRISES

Name of the function	Symbol of the function	Formula	Coefficient of connection
Enterprise No.1			
Combinational logical connection	CMLOGC No. 1	$y_{xz} = \dfrac{1}{\dfrac{1}{y_{min}}-B\left(d_{1-\frac{1}{x_{min}}\cdot\frac{1}{x_i}}+d_{1-\frac{1}{z_i}\cdot\frac{1}{z_{max}}}\right)}$	0,857
Enterprise No.2			
Multiple parabolic connection	M_ parabola	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{(x_i,x_0)}{x_0}\cdot\frac{(x_i,x_0)}{x_0}-1}+d_{1-\frac{(z_i,z_0)}{z_0}\cdot\frac{(z_i,z_0)}{z_0}-1}\right)\right]$	0.806
Enterprise No.3			
Multiple parabolic connection	M_ parabola	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{(x_i,x_0)}{x_0}\cdot\frac{(x_i,x_0)}{x_0}-1}+d_{1-\frac{(z_i,z_0)}{z_0}\cdot\frac{(z_i,z_0)}{z_0}-1}\right)\right]$	0.896
Enterprise No.4			
Multiple linear combinational connection	CMLC No. 2	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{x_i}{x_{max}}}+d_{\frac{z_i}{z_{min}}-1}\right)\right]$	0.818
Enterprise No.5			
Multiple hiperbolic combinational connection	CMHC No. 2	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{1}{x_i}\cdot\frac{1}{x_{max}}}+d_{1-\frac{1}{z_{min}}\cdot\frac{1}{z_i}}\right)\right]$	0.779
Enterprise No.6			
Multiple hiperbolic combinational connection	CMHC No. 2	$y_{xz} = y_{max}\left[1-B\left(d_{1-\frac{1}{x_i}\cdot\frac{1}{x_{max}}}+d_{1-\frac{1}{z_{min}}\cdot\frac{1}{z_i}}\right)\right]$	0.936
Enterprise No.7			
Multiple ligic Combinational connection	CMLOGC No. 2	$y_{xz} = \dfrac{1}{\dfrac{1}{y_{max}}+B\left(d_{1-\frac{1}{x_i}\cdot\frac{1}{x_{max}}}+d_{1-\frac{1}{z_{min}}\cdot\frac{1}{z_i}}\right)}$	0.700

Calculated by using modern computer software, the parameters of single-factor equations and coefficients of communication stability on the indicators of labor activities of staff,, the data of which show that only three indicators of production activity can be selected from among the selected factor indicators for conducting reliable analytical calculations (namely, the value of the coefficient of stability of the connection is equal to or greater than 0,7 x11, x25 and x30.

Determining the form and strength of the relationship between the behavioral and productive characteristics of staff work based on the construction of an economic-statistical model of a multi-factor linear relationship between the most

influential factor indicators significantly changes the mechanism of production system functioning and allows to predict the change of the productive feature by calculations.

TABLE IV. THE MOST SIGNIFICANT INDICATORS OF THE INFLUENCE OF PRODUCTION PERSONNEL ACTIVITY BY THE AVERAGE ANNUAL PRODUCTION

Year	Factor			Empirical effective sign ye
	x_{11}	x_{25}	x_{30}	
N_1	1.020	6.066	4.176	196810.2
N_2	1.020	6.030	4.219	228014.0
N_3	1.021	5.753	4.480	258992.8
N_4	1.021	2.388	4.698	615146.0
N_5	1.106	1.017	4.908	783255.3
N_6	1.082	1.508	4.765	528217.1

That is, the solution of the inverse economic task involves determining the necessary change in the levels of factor indicators to ensure an increase in the average annual output of one employee (y) by a certain value [13, p. 73]. Note that the method of regression analysis does not solve this problem (Table 5).

TABLE V. ESTIMATED NORMATIVE VALUES OF BEHAVIORAL FACTORS, WHICH FORM THE AVERAGE ANNUAL OUTPUT OF ONE EMPLOYEE

Factor	Estimated normative factor value	Necessary factor change to achieve a normative change of the effective trait	
		absolute value	*%*
Employer exploitation rate according to qualification x_{11}	1.09	0.01	0.9
The complexity of the manufactured product unit x_{25}, person-hours	0.86	−0.65	−43.0
Indicator of integral assessment of employee labor behavior x_{30}	4.82	0.06	1.2

Source: calculated by authors.

For this purpose, for the next year, with the growth of the average annual output of one employee, for example, by 7%, in comparison with the actual performance of this indicator in the previous year, the value of deviations of the coefficient of comparison of the given, predicted or normative value of the effective trait ( ) with its previous level (according to the chosen model of the relationship - LPC No. 2 and LOC No. 2), which is - 0.07. The analysis makes it possible to assert that the change in the total size of the deviations of the coefficients of comparison of factor characteristics per unit (Figure 1) causes a change in the size of the deviations of the theoretical values of the result of the characteristic in 0,155 times.

We also note that the comparison coefficients indicate the magnitude of the change (increase or decrease) of the attribute in comparison with the accepted comparison base.

Unlike the elasticity coefficients known in the statistics, the parameters of the dependence equation, which are determined by the method of deviations, allow to take into account not only the influence on the resultant sign of one factor, but also the combined effect of factors [14, p. 259].

The use of statistical equations of dependencies as a method of quantifying the relationship between performance attribute and factor indicators allows to solve the important

tasks of determining the main reserves of labor productivity improvement by changing the most significant indicators of staff labor activity.
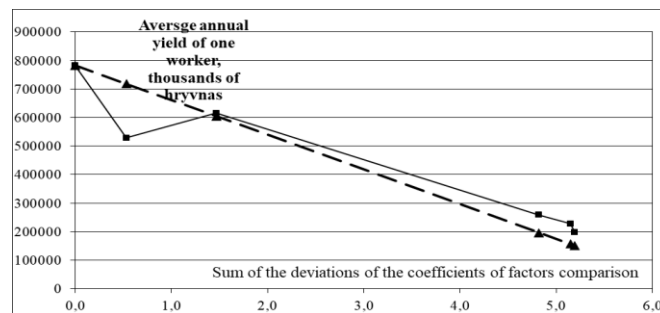

Fig. 1. Dependence of the level of average annual output per worker from the basic behavioral indicators of its formation
Source: built by authors.

On the basis of the coefficients of comparison of the productive and factor characteristics, the parameter of the equation of dependence is calculated. (Table 6).

TABLE VI. THE RATING OF INFLUENCE ON THE STATE OF EFFICIENCY OF FUNCTIONING BY THEIR SHARE OF INFLUENCE ON THE LEVEL OF AVERAGE ANNUAL PRODUCTION

Factor	The sum of the comparison of investigated factors $\sum_{i=1}^{n} d_{x_{ji}}$	The share of the influence of each factor on the level of average annual output of one employee of PJSC " Enterprise No.1" Δx_j, %	Rating of the factor influence
Employer exploitation rate according to qualification x_{11}	0.333	1.94	3
The complexity of the manufactured product unit x_{25}. person-hours.	16.389	95.45	1
Indicator of integral assessment of employee labor behavior x_{30}	0.449	2.61	2
Total	17.171	100.00	–

Source: calculated by authors.

So, for the growth of a productive indicator of the industrial activities of industrial enterprises by 7%, the behavioral indicator x_{25} at enterprise No.2 should decrease by 54.9%; at the enterprise No. 4 - by 43%; at the enterprise No.7 - by 37.7%, at the enterprise No. 3 - only 1.9%. As for the behavioral index x11, it directly proportional to the value of the average annual output. The greatest increase of this factor's indicator for the increase of the effective indicator is required for enterprise No. 5 and enterprise No.6 - by 1.9%, and the smallest change in the value of the indicator is characteristic for enterprise No.7 - an increase of 0.1% according to the level of the indicator in N6. The rating of the influx of all behavioral factors on the resultant sign will be presented in the table 7. By the rating of the cumulative influence of behavioral factors of production activity x_{11}, x_{25} та x_{30} on the efficiency of the functioning of industrial enterprises, the most influential behavioral indicators

determined, the changes of which at the enterprise need to be monitored. Thus, on the basis of the application of an integrated system of behavioral indicators of production activity, using the method of statistical equation of dependence, it is possible to model their influence on the value of a universal generalizing indicator of the efficiency of industrial enterprises, which opens the prospects for a possible increase in labor productivity through the regulation of labor indicators of production and economic the activity of an industrial enterprise.

TABLE VII. RATING OF FACTORS INFLUENCING THE STATE OF PERSONNEL LABOR BEHAVIOR BY THE PROPORTION OF THEIR INFLUENCE ON THE LEVEL OF AVERAGE ANNUAL PRODUCTION OF ONE EMPLOYEE AT INDUSTRIAL ENTERPRISES

Enterprise	Behavioral factor of personnel labor behavior		
	Employer exploitation rate according to qualification x11	*The complexity of the manufactured product unit x25, person-hours*	*Indicator of integral assessment of employee behavior x30*
The share of the influence of each factor on the level of average annual output per employee, %			
Enterprise No.1	25.58	32.94	41.47
Enterprise No.2	0.71	91.81	7.48
Enterprise No.3	2.85	84.68	12.46
Enterprise No.4	1.94	95.45	2.61
Enterprise No.5	29.21	13.48	57.32
Enterprise No.6	7.98	79.51	12.51
Enterprise No.7	0.93	95.48	3.58
The rating of the factor's influence on the level of average annual production of one employee			
Enterprise No.1	3	2	1
Enterprise No.2	3	1	2
Enterprise No.3	3	1	2
Enterprise No.4	3	1	2
Enterprise No.5	2	3	1
Enterprise No.6	3	1	2
Enterprise No.7	3	1	2

Source: calculated by authors.

The parameters of the equation of multi-linear combinational dependence between the most influential behavioral indices of production activity and the effective index of industrial enterprises using the computer program "Method of statistical equation of dependencies" [15] will have an economic-statistical model:

Therefore, the implementation of the mechanism for increasing the efficiency of the operation of industrial enterprises on the basis of economic and statistical modeling of the relationship of behavioral and effective indicators of production activities, the components of which is the diagnosis and monitoring of labor behavior, should be carried out continuously at industrial enterprises in order to maintain and achieve the necessary performance of their activities.

VI. CONCLUSIONS

Consequently, the construction of functional theoretical models of the relationship of behavioral indicators of production activity with a productive indicator of labor involves the definition of norms based on the factor taking into account in order to achieve the optimum of the resultant sign in the preparation of appropriate management decisions. The significance of the construction of functional theoretical models is that they can help determine the ways to increase the level of the productive feature in perspective. The solution of such an important task, as the definition of optimal levels of behavioral factors, that is, their prediction, is based on the solution of the inverse problem, which is one of the functional capabilities of the method of statistical equations of dependencies. Prospects for further use of the obtained scientific result are the possibility of improving the mechanism of functioning of industrial enterprises due to the practical application of certain combinational dependence between the behavioral variables of the models of their production systems.

REFERENCES

[1] J. Vaingurt, "Poetry of Labor and Labor of Poetry", *The Universal Language of Alexei Gastev's Biomechanics*, vol. 2, pp. 209-229, April, 2008.

[2] F. D. Brown, V.J.D. Pietra, S.A.D. Pietra, and R.L. Mercer, "The mathematics of statistical machine translation: Parameter estimation", *Computational linguistics*, vol. 19, no 2, pp. 263-311, 1993.

[3] S. S. Gerasimenko, A. V. Golovach, A.M. Erina, *Statistics*. Kiev, Ukraine: KNEU, 2000.

[4] Y. Prydannykova, *Application of an index method for assessment of impact of inflation on expected household income*. Khmelnytskyi: Ukraine: Universitetski naukovi zapiski, 2017.

[5] A. I. Kochetkova, *Introduction to Organizational Behavior and Organizational Modeling*. Moscow, Russia: Delo, 2003.

[6] R. O. Kulinich, Yu. E. Pridannikova, "Application of the method of statistical equation of dependencies for estimating the dynamics of the regional human development index of the Khmelnitsky region", *Scientific Bulletin of the National Academy of Statistics*, no. 3, pp. 13-22, 2017.

[7] R. O. Kulinich, *Statistical methods of analysis of the relationship of indicators of socio-economic development*. Kiev, Ukraine: Format, 2008.

[8] N. P. Bazaliyska, M. D. Vedernikov, "Innovative technologies of personnel management of the industrial enterprise", *State and regions*: *Economics and Business*, vol. 102, no. 3, pp. 72–79, 2018.

[9] N. Bazaliyska, "Ensuring effective personnel management on the principles of labour behavior monitoring", *Norwegian Journal of development of the International Science*, vol. 2, no. 4, pp. 26-31, 2017.

[10] N. S. Bezrukov, E. V. Kolosova, "Methods of regional clustering on human capital parameters based on self-learning neural networks", *Management in socio-economic systems*, vol. 15, no. 1, pp. 96-102, 2008.

[11] A. A. Halafyan, *Statistica 6. Mathematical statistics with elements of the theory of probability*. Moscow, Russia: Binom-press, 2010.

[12] A. A. Madyih, A. A. Ohten, A. F. Dasiv, "Economic-mathematical modeling of smart enterprises: global experience and prospects", *News of Economics of Ukraine,* vol. 35, no. 2, pp. 130-143, 2016.

[13] A. V. Golovach, V. B. Zahozhay, and N. A. Golovach, *Statistical provision of economic management: applied statistics*. Kiev: Ukraine: KNEU, 2005.

[14] R. O. Kulinich, Programne zabezpechennya statistichnih metodiv. Software of statistical methods, 2013. [Online]. Available: http://www.kulynych.in.ua/ software-statistical-methods. Accessed on: May 20, 2019.