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Personnel Potential of National Economy and Gross Domestic Product: The Case of Ukraine

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ABSTRACT

In today's conditions characterized by the rapid development of science and technology, the implementation of their achievements in all spheres of public life, it is extremely important to predict which industries will be actively developing, which will give rise to new technologies, products, management practices and what new specialists will need. Therefore, for the effective management of human resources at the state level, it is necessary to know clearly how many and what specialists to prepare and what skills and abilities they need to possess in order to be in demand in the new economy. The purpose of the study is to identify opportunities for planning the development of the human resource potential of the economy and to study the impact on the country's gross domestic product (GDP) of this indicator. In this study, the dynamics and predicted values of GDP and indicators characterizing the human potential are investigated. The factor model of the dependence of the total GDP on the determined factors is constructed. The model showed the main factor affecting the resulting indicator. It has been established with the help of research that the largest changes in employment will be observed in the field of information and telecommunications, which is almost twice as low in industry and in the financial sector. It is these workers who will need the largest national economy in the near future. The systematic approach was used in the process of writing the article as one of the basic methods of scientific research, methods of economic and mathematical modelling in the process of developing a strategy for managing the personnel potential of the national economy, methods of analogies, retrospective analysis and the classical method of hypotheses.

INTRODUCTION

It is extremely important to predict which industries will be actively developing, in which new technologies, products, management practices and new specialists will be needed in today's conditions characterized by the rapid development of science and technology, the implementation of their achievements in all spheres of public life.

Therefore, for the effective management of human resources at the state level, one needs to know clearly how many and what specialists to prepare and what skills and skills they need to possess in order to be in demand in the new economy. The answers to these questions provide a strategic planning process for the development of human resources, since the development and application of its effective mechanisms enables the formation of a highly skilled composition of domestic specialists.

The study of institutional support for the management of human resources in Ukraine has shown that within 20 years normative documents aimed at overcoming negative phenomena in the labour market, their coordination with strategic directions of social and economic development of the country and regions, regulation of functional interaction of branch bodies of executive power responsible for different spheres: economic, social, demographic, educational.

The norms of these documents are steadily ignored, and forecasting of labour market needs in specialists, taking into account the trends of economic development and demographic changes, is not carried out, which results in the non-use and depreciation of the educational and qualification potential acquired by the personnel on the domestic labour market, as well as its outflow beyond Ukraine (Arzamasova, 2017; MONU, 2018; NISS, 2018; UkrStat, 2018). Therefore, improving the planning of staffing needs in line with the requirements of the country's economy and regional labour markets is one of the top priorities for today.

The concept of management strategy of human resources appeared in Western Europe as a response to the rather difficult economic conditions existing in the early 80's. These conditions dictated the need for further development of the theory of management, contributed to the emergence of a new approach to personnel organizations, expanding the scope of the strategic approach in human resources management.

1. LITERATURE REVIEW

Theoretical, methodological and applied research issues in the field of strategic human resource management are related to the publication of works by Devanna, Fombrun, Tichy (1999), and then – Bamberger and Meshoulam (2000), Meshoulam and Baird (1987). At the same time, many scholars have focused on the development of strategic management of human resources in scientific works. There is also a tendency to approach the realm of studying strategic management and strategic management of human resources.

Problems of strategic management of human resources were given by such scientists as: Ulrich, Brockbank, Yeung, et al (1995), Delery and Doty (1996), Baird and Meshoulam (1988), Wright and Snell (1991), Aubrey (2011 and 2016), Hill (2017), Bergh, Aguinis, Heavey, et al (2016), Sharov (2017), Armstrong (2006), Westhues, Lafrance and Schmidt (2001), Devanna, Fombrun and Tichy (1999), Meshoulam and Baird (1987), Meshoulam and Baird (2000), Chukhno (2007), Schekin (2008), Fedorova and Karpenko (2011) and others.

2. METODOLOGY

In a methodological plan, thoughts are presented by us in such sequence. In the first stage, we list the common starting points of their arguments – the preconditions and conditions of the vision. At the next stage, an attempt was made to present our arguments regarding the specified range of problem issues. Moreover, at the third stage, we dwelt on two scenarios of a possible solution of the problem, the solution of which in general will most depend on institutional changes and overcoming psychological barriers

In the process of writing the article, the system approach was used as one of the basic methods of scientific research, methods of economic and mathematical modelling in the process of

developing a strategy for managing the personnel potential of the national economy, regressive dependencies, analogical methods, retrospective analysis and the classical method of hypotheses.

3. RESEARCH RESULTS

We note without revealing secrets: a society is economic in the sense that the basis for the life of its members is the production and consumption of products and services. This process is carried out due to a number of factors, the main of which is a person, his work. Man as a factor of production, undeniably, from the point of view of economic processes, is identified with labour and within the country it is a staffing potential. The economy begins with the person. But a person cannot be isolated in a certain system of state organization, be free from it, and therefore it affects on this system. In most consciousness of a person depends on the state of the economy, but not always subject to it.

Kant I. defined "*architectonics as the art of building a system. Since it is systematic unity that first transforms ordinary knowledge into science, that is, a simple aggregate of knowledge on a system, then architectonics is the doctrine of the scientific in our cognition in general, and therefore it needs to belong to the methodology*" (Kant, 1999, p. 470).

After analyzing the state of ensuring the spheres of the national economy by highly skilled personnel, we see that the mechanism of uncertainty in the formation of their needs is preserved. The main problem is lack of information provision, which is the basis for developing forecasts and building strategic plans. This is due to the fact that business entities do not provide reliable information, the level of professional qualifications of employees constantly changes, and methods of centralized collection of statistical data on qualification requirements, a set of knowledge, skills and abilities for specific positions are not developed (definition of qualitative characteristics of specialists that required by the economy, entrusted to the Ministry of Education and Science of Ukraine, which has no mechanisms for obtaining such data).

Information about vertical (upward or downward) and horizontal (change of activity) mobility of workers is not going to be collected in Ukraine. The lack of true information on the employment of graduates (regardless of the form of ownership of the employer) makes it impossible to determine a reasonable need for specialists of one or another specialization. The state theoretically can predict only the educational and qualification requirements and the need of their own employees (the apparatus of state administration) (NISS, 2018; Sharov, 2017; Salo, 2015; Klymeniuk and Vysokos, 2016).

Issues studied in the article are relevant and in a methodological plan were investigated by a number of scientists. Thus, the empirical assessment of personnel competencies was investigated by Ulrich, Brockbank and Yeung (1995), theorizing regimes in strategic management of personnel, tests of universal, unpredictable and configurational indicators – Delery and Doty (1996), options for strategic personnel management – Baird and Meshoulam (1988), integrated concept of human resource management – Wright and Snell (1991), strategic management of the production function – Hill (2017), use of the purpose of analytical modelling of structural equations to promote strategic management research – Bergh et al (2016). This list can be greatly expanded, giving deserved honour to the scientists who investigated the identified problem. But this is not the task of our study, but it is more of a subject of scientific discussions of a retrospective nature.

Fundamental issues remain unresolved along with significant scientific developments in the economic literature: there are no methods for calculating projected indicators for the development of human resources and their impact on the country's GDP. They should be based on statistical data (retrospective) and have some dynamics (perspective).

The research of dynamics of indicators for the development of personnel potential and their influence on GDP of the country on the basis of statistical data with the help of package of processing of statistical data STADIA is carried out. The obtained regressive dependences are given in the *Table 1*, where:

y – total GDP in actual prices;
x_1 – labour productivity per busy one;
x_2 – number of persons who studied in higher educational establishments;
x_3 – share of realized innovative products in the volume of industrial;
x_4 – volume of performed scientific and technical works in actual prices;
x_5 – share of commercialized scientific and technical developments in GDP, %,.

Regression dependences are adequate to experimental data, which have a high correlation and determination coefficient. This gives rise not only to carry out the forecast parameters, but also to carry out calculations for previous periods in order to study the available statistical data for their comparison.

According to the projected calculations, the trend of growth in total GDP in actual prices is traced. Also, the productivity of labour in the next three years and the volume of scientific and technical work performed will increase.

At the same time, the number of people who have studied in higher educational institutions, the share of innovative products in the amount of industrial and specific weight of the performed scientific and scientific-technical work in GDP will be reduced. So, we can say that the problem of commercialization of knowledge, which exists today, will continue in the next five years. Therefore, the GDP growth, which is projected from our calculations, will be very low (1.1%), insufficient for the emergence of a new economy.

Table 1. Dynamics and projected values of GDP and indicators, characterizing the human potential

Indicator	*Dependency type and statistical estimates t-time interval, year*	*Estimated values*	
Total GDP in fact prices, *UAH million*	$y = 419000 + 141400t,\ R = 0.9819$	2018 2019 2020	2257000 2398000 2540000
Productivity, thousand UAH per busy one	$y = 14.02 + 8.903t,\ R = 0.9615$	2018 2019 2020	129.8 138.7 147.6
Number of persons who have studied in higher educational institutions, *thousand people*	$y = 3113 - 156.3t,\ R = 0.8176$	2018 2019 2020	1081 924.7 768.4
Share of realized innovative products in volume of industrial, %	$y = 7.373 - 0.5733t,\ R = 0.9769$	2018 2019 2020	-0.08 -0.653 -1.227

The volume of scientific and technical work performed in factual prices, *million of UAH*	$y = 5621 + 724.5t,\ R = 0.9552$	2018 2019 2020	15040 15760 16490
Specific weight of the volume of commercialized scientific and technical developments in GDP, *%,*	$y = 1.031 - 0{,}03515t,\ R = 0.9409$	2018 2019 2020	0.5744 0.5392 0.5041

Source: Arzamasova, 2017; UkrStat, 2018; MONU, 2018.

Let's determine the regressive dependence of dynamics in order to determine the factor impact of indicators on the country's forecast GDP. For this purpose, linear models and optimum models are used. The optimum model describes the dependence on the sharp extremum and the subsequent inclined approach to the boundary *y=0*.

Multiple linear regressions:

$$y = 831351 + 7602x_1 - x_2 + 7185x_3 + 64x_4 - 897848x_5, R^2 = 0{,}9997.$$

It is presented in *Table 2*.

Table 2. The result of regression for the dependent variable (GDP)

	Beta	*Standard error for Beta*	*V. GDP*	*Standard error for V*	*t (4), Coefficient of regression equation*	*p (probability of zero hypothesis)*
Free variable			831351	174241.2	4.77126	0.008832
Var2, x_1	0.488881	0.046974	7602	730.4	10.40756	0.000481
Var3, x_2	–0.001270	0.015848	–1	11.9	–0.08011	0.939996
Var4, x_3	0.029286	0.040151	7185	9850.1	0.72939	0.506175
Var5, x_4	0.334921	0.028636	64	5.4	11.69599	0.000306
Var6, x_5	–0.232986	0.033577	–897848	129393.3	–6.93891	0.002265

Source: own calculation

The factor model of the dependence of total GDP on these factors has shown that the main factor of influence on the resulting indicator is formed under the influence of factors (x_1, x_4). They explain 99.96% of the changes.

Change x_1 for one mean square deviation causes a change in the resulting factor to 0.489 of its mean square deviation, provided that other factors are fixed.

Change x_4 for one mean square deviation causes a change in the resulting factor to 0.3349 of its mean square deviation, provided that other factors are fixed.

That is, the projected GDP growth will depend on such indicators of efficient use of personnel potential as labour productivity and the amount of scientific and technical work performed. Such tendencies are characteristic of the new economy.

Forecasting the number of employed in the main types of economic activity (*Table 3*) is characterized by a slowed average annual decline. Such dynamics is logical in the context of reducing the number of economically active population, which we examined in the previous section of the work. However, this decline will not have an impact on GDP growth at the expense of rising labour productivity.

Table 3. Forecasting number of employed population by species of economic activity, thousand people

Indicator	Dependency type and statistical estimates t - time interval, year	Forecast values	
Agriculture	$y = \frac{t}{2{,}61 \cdot 10^{-6} + 0.000262t + 8.085 \cdot 10^{-6} \cdot t^2}$, $R = 0.9997$	2018 2019 2020	2907.2 2859 2812.4
Industry	$y = 4182.9 - 127.03t$, $R = 0.9554$	2018 2019 2020	2404.5 2277.5 2150.4
Trade	$y = \frac{t}{3.4537 \cdot 10^{-6} + 0.0001605t + 7.62 \cdot 10^{-6} \cdot t^2}$, $R = 0.9936$	2018 2019 2020	3739.7 3636.3 3538.4
Information, telecommunications	$y = 151.45 + 15.467t$, $R = 0.8710$	2018 2019 2020	368.00 383.06 398.93
Financial activities	$y = \frac{t}{5.662 \cdot 10^{-5} + 0.00186t + 1.7504 \cdot 10^{-4} \cdot t^2}$, $R = 0.9932$	2018 2019 2020	231.69 222.68 214.33
Education	$y = \frac{t}{3.9812 \cdot 10^{-6} + 0.000522t + 1.107 \cdot 10^{-7} \cdot t^2}$, $R = 0.9948$	2018 2019 2020	1477.4 1453.6 1430.6
Health care, social services	$y = 1442.3 - 27.292t$, $R = 0.8791$	2018 2019 2020	1060.2 1032.9 1005.6
	$y = \frac{t}{8.0528 \cdot 10^{-6} + 0.0005714t + 3.102 \cdot 10^{-5} \cdot t^2}$, $R = 0.9939$	2018 2019 2020	993.76 964.07 936.10

Source: own calculation

Coefficient of variation that characterizes the variability of the dynamic series Eq. 1

$$K_{VAR} = \frac{\sigma(x)}{\bar{x}} \cdot 100\,\%. \qquad (1)$$

The received calculations will be included in the *Table 4.*

Table 4. Coefficients of variation in the number of employed by types of economic activity

Indicator	*The value of the coefficient of variation*
Agriculture	8.25%
Industry	14.62%
Trade	8.32%
Information, telecommunications	27.30%
Financial activities	14.36%
Education	4.51%
Health care, social services	9.19%

Source: own calculation

The most variable (the coefficient of variation is 27.3%) we have the type of activity – "information, telecommunications". That is, the largest changes in employment will be observed in the field of information and telecommunications, which are almost twice lower in the industry and in the financial sector. The national economy will require most of these workers in the near future. The development of a perspective vision of human resource development requires strategic analysis. One of the most important of its methodological tools is the SWOT-analysis (*Tools*, 2012; *Dess*, 2018; *Armstrong*, 2006). It is based on an objective assessment of the strengths and weaknesses of the object, the possibilities of its development and the associated threats. This method should be used to summarize critical issues that have a promising impact on the situation, so that the desired tasks and results become more understandable. Therefore, we propose to analyze the process for increasing the efficiency of the use of human resources in the context of its impact on the new economy from the standpoint of SWOT-analysis.

It will be possible to develop a concept of development and a strategy for its implementation based on the implemented analysis, taking into account the strengths and weaknesses of the development of human resources, capabilities and threats to its development. The SWOT analysis of the personnel potential of the national economy is presented in *Fig. 1*.

We detail the matrix in terms of the components that characterize the personnel potential, supplemented by their criteria of assessing the impact of such external factors on the development of personnel potential as follow:

- demographic situation;
- education and qualification;
- creativity;
- innovation;
- motivation;
- international rating of the country's competitiveness;
- institutional environment;
- international relations.

Comparative advantages of the development of the personnel potential of the national economy that are determined by analyzing strengths and opportunities:

- the forecasting growth of high-tech, highly profitable industries can be a comparative advantage of the national economy, taking into account a number of strengths, such as a sufficient basis for staffing capacity formation;
- its high educational and qualification level;
- good index of creativity;
- mobility of workers.

The development of the domestic consumer market and the annual dynamic growth of the economy will become an accompanying result of this process.

The processes of commercialization of knowledge will stimulate the active involvement of local authorities into the innovation process, the development of social partnership, membership in international organizations, which will allow access to new markets, technologies, management standards and contribute to creating conditions for investment inflows.

Figure 1. SWOT analysis of factors influencing the development of Ukraine's personnel potential in the context of construction of a new economy

STRONG PARTIES (S)	WEAK PARTIES (W)
– sufficient base of personnel potential formation; – high educational and qualification level of personnel potential; – high creativity index; – mobility of workers; – the formation of a legal and regulatory framework in the field of labour market regulation and migration; – active inclusion of local authorities into the innovation process; – social partnership; – membership in many international organizations, which provides access to new markets, technologies and management standards.	– negative demographic increase of the population; – high level of hidden and youth unemployment; – inconsistency of the education system with the requirements of the new economy; – low level of education throughout life; – labour market imbalances; – weak level of scientific research and development; – low-tech, uncompetitive economy; – migration of young people and skilled personnel; – low level of cooperation between education, science and industry; – absence of the concept of management of human resources and strategies for its development; – a weak role in geopolitics, dependence on external political and economic subjects
OPPORTUNITIES (O)	**THREATS (T)**
– reformation of education and science; sectors – development of high-tech, highly profitable branches of industry; – development of small innovative business; – development of the domestic consumer market; – annual dynamic growth of the economy; – creation of conditions for inflow of investments; – raising social standards of living; – commercialization of knowledge; – growth of openness of the domestic economy.	– reduction of the number of economically active population; – ineffective employment policy; – low quality of professional training; – insufficient and ineffective financing of education and science; – continuation of the economic downturn; – low level of wages; – a decline in the living standards of most of the population; – lack of forecasting and planning of staffing needs; – increasing the influence of external actors on domestic politics, destabilization of the economy.

Challenges are identified by analyzing weaknesses and opportunities:

- reforming the education system will help to increase its quality and compliance with the requirements of the new economy and forecasting the need for specialists, extending education throughout life. The expected outcome of such processes will be the elimination of labour market imbalances;
- development of high-tech, high-efficiency industries, the commercialization of knowledge will increase the number of scientific research and development; will promote cooperation between education and science and industry, which in turn will reduce unemployment and increase the competitiveness of the economy;
- improving social standards will stop the demographic decline and the migration of young people, skilled personnel.
- Risks are identified as a result of analysis of weaknesses and threats:
- further growth of hidden and youth unemployment is possible due to ineffective employment policy;
- inconsistency of the education system with the requirements of the new economy and labour market imbalances may increase due to the poor quality of vocational training; absence of the system of forecasting and planning of requirements for specialists at all levels of management;

- the weak level of research and development will remain due to inefficient and inadequate public funding for the education and science sector, the lack of cooperation between science and industry;
- low level of wages, falling living standards can have a negative impact on the existence of such weaknesses in the personnel potential of the national economy as migration of young people and skilled personnel;
- the continuation of the economic decline will cause a decrease in the competitiveness of the economy, its technological backwardness.

Two scenarios for developing the human potential of the national economy of Ukraine are hypothetically proposed by us based on the forecasting calculations and the SWOT analysis matrix – inert and optimistic. The medium-term perspective has been selected as a forecast period, which is explained by the instability of the economic and political situation in the country, and it is impossible to develop long-term scenarios for the development of the personnel potential of the national economy under such conditions.

The main starting points of the inertial scenario are:

- stabilization of the economic situation, which implies insignificant increase in GDP;
- moderate growth of labour productivity;
- gradual reform of the sphere of education and science;
- insignificant growth of research and scientific works;
- gradual simplification of the rules for doing business;
- unchanged tax burden on business entities and population;
- limited access of enterprises to loan capital;
- low incomes of the population (*Sidorova & Kovalenko*, 2017, *EUROSTAT*, n.d., *State Statistics Service of Ukraine*, 2017).

The main starting positions of the optimistic scenario are:

- intensive economic growth, caused by the development of high-tech industries;
- improvement of the investment climate, which will determine the inflow of foreign investments;
- large-scale state financial and organizational support of the scientific sphere for ensuring structural adjustment of the economy;
- qualitative and in-demand vocational education, corresponding to the conditions of the innovative economy;
- intensive growth of research and development;
- close cooperation of education and science with industry will intensify the commercialization of knowledge.

Inert scenario (measures are being implemented to develop the personnel potential of the national economy, although the social and economic state of the country does not contribute to this). The scenario is based on the inevitable emergence of certain objective and subjective deterrent factors that prevent the realization of available human resources on the way of building a new economy. Public expectations will motivate central and regional authorities to reform the social and economic system, but inertial processes in the area of education, science, material production and, more importantly, in the public consciousness will inevitably become barriers to the rapid implementation of reforms.

The interaction of all parts of the management of human resources (state, regional, local self-government) will be the main system-forming factor.

The result will depend on their determination, compromise, the desire and ability to involve an active part of the population to the processes. The main task of the system of public administration will be the formation of inevitable changes in the minds of people about the need for technological,

social and economic modernization of the country and the region. The main partner of the authorities should be an economically active and creative class and youth. Public support for reforms will affect the transition to an optimistic scenario.

Optimistic scenario (the capabilities of personnel potential are actively used in conditions of innovative development of the country). In this scenario, the country becomes a model and an example of innovative social and economic transformations that shape a new economy. The main priority is the sustainable development of the economy, which contributes to the realization of opportunities and the comprehensive development of human resources as the main factor of production.

The preconditions for implementing an effective investment and innovation policy, which will result in a significant investment resource for the creation of new high-tech enterprises in all sectors of the economy, will create in the country. The economic profile of the state is steadily shifting towards high-tech innovative sectors: machine building, instrument making, IT sector, etc. There is a technological modernization of a number of export and oriented industrial enterprises, whose products are brought to European markets. There is a shift towards small enterprises and cooperative associations in the agrarian sector. The production of agricultural products is based on European standards.

A serious incentive for development will be the small and medium innovative business as an environment for material support and service of strategic investors. The need for highly skilled personnel resulting from technological modernization will be met through improved education, training and retraining. The leading universities that will be in demand in the innovative components of the country's economy will gain special significance. Decisive changes in the administrative system will transfer significant financial resources to the community level. Their resource base will be strengthened through the transfer of powers to manage the resources of the territories. Social and communal infrastructure of communities is beginning to develop, which enhances some kind of life of the population, contributing to the reproduction of human resources, creation of favourable conditions for its development.

Active operation of public organizations promotes the uniting of talented youth by the sphere of interests, marketing promotion of new products created by them, search of investors for implementation of innovations. The country is moving to a new level of its development, approaching the European indices of human development.

Consequently, the inert scenario of the development of the personnel potential of the national economy, which will be implemented in the near future, should gradually become optimistic that will help to build a new economy and bring the country closer to the European pace of development. Cooperation of subjects at all levels of human resource management, a clear understanding of their functions, and, importantly, – an understanding of the role and aspiration of society to technological change is necessary for this purpose.

CONCLUSION

The conducted research proves that it is logical to strengthen the function of forecasting the need for personnel at all levels of human resource management today in Ukraine. It is necessary to develop a comprehensive approach to forecasting the needs of qualified specialists and workers of manufacturing and non-productive to do this, taking into account the structure of the national economy; to introduce a representative national survey of the able-bodied population on employment issues on a regular basis in order to determine the indicators of educational and professional compliance, mobility of workers; to ensure the development of a methodology for collecting and defining data concerning: the qualification of employees and their compliance with the education they receive; the real ratio of demand and supply of personnel on the labour market of Ukraine.

The realization of the foregoing undoubtedly requires further researches. In the first place, we

would pay attention to the issue of a forecast analysis of the development of the economic system as a whole and the impact of the personnel potential of the state on this system. "Foresight" methods deserve particular attention. Also, in our opinion, attention should be paid to the use of artificial intelligence in forecasting. Its time is not far off, and a system research on the possibilities of application in management, unfortunately a small amount. This is not an exhaustive list of further research directions.

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