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## PERSONNEL POTENTIAL OF INDUSTRIAL ENTERPRISES: FORMATION AND MANAGEMENT

**Purpose.** Establishing the prerequisites for the formation of the company's personnel potential system and the search for possible ways of its development via the example of machine-building enterprises of Ukraine.

**Methodology.** The research uses general scientific methodology: analysis, synthesis, systematization, comparison method. Data from the financial statements of enterprises, which are publicly available, were used for calculations. The object of the work involves large machine-building enterprises of Ukraine.

**Findings.** A detailed study of the activities of ten enterprises of the machine-building industry of Ukraine was carried out. The existing state of personnel resources and factors that shape the personnel potential of the enterprise and have an impact on its development are analysed. The authors' own approaches to personnel potential assessment are proposed.

**Originality.** A comprehensive analytical toolkit for evaluating the personnel potential of an enterprise, which includes an integral indicator of personnel development, the level of profitability of personnel potential, and potentially possible income from the use of personnel potential is proposed. Unlike existing methods, the use of this evaluation complex eliminates the dependence of results on the subjective opinion of the evaluator and makes it possible to determine the most effective directions for improving the personnel potential of industrial enterprises.

**Practical value.** The result of the work is the development of the authors' indicators of the analysis of the personnel potential of the enterprise such as the personnel development index, the profitability of the personnel potential and the amount of potentially possible income from the use of the personnel potential. Any enterprise, regardless of its size, personnel and industry, can use these indicators to calculate the existing level of personnel potential.

**Keywords:** *personnel, personnel potential, industry, mechanical engineering, labour productivity*

**Introduction.** The problem of building an effective system of using personnel potential at the enterprise, especially by stimulating personnel, is one of the most urgent and important in today's changing economic conditions and during innovative transformations of the economy. Therefore, it is impossible to overestimate the importance of researching the theoretical foundations and finding ways of practical implementation of stimulation and development of personnel at modern enterprises.

Recently, the Ukrainian industry has been experiencing difficult times. Low investment attractiveness, constant staff attrition, inflation and economic crises have been severe challenges for the industry in recent years, and the global pandemic and full-scale war have further intensified these processes, especially in the field of human resources [1]. At the moment, it is impossible to estimate exactly what consequences the Ukrainian industry will face after the war, but the society will have to survive the biggest all-round crisis since the country's independence, and the industry faces both great risks and potential opportunities. The country will undergo large-scale reconstruc-

tion and modernization, and although some enterprises will not survive the inevitable crisis, others will have the opportunity to significantly increase production volumes in order to overcome the consequences of the war and restore Ukraine [2].

According to UNHCR estimates, as of the end of 2023, more than 6 million Ukrainians have received protection in other countries as refugees, with the largest group of people (about 35–37 %) by age being the most valuable labor resources – people aged 30 to 39 [3]. Such an outflow of qualified personnel from the country has a critical negative impact on the functioning of the economy and exacerbates the already existing crisis in certain sectors of the economy, particularly in industry. Due to the difficult working conditions, the industrial sphere has always faced certain difficulties in encouraging new workers to find employment, and with the beginning of a full-scale invasion, when the demands of flexible schedules and the possibility of remote work appeared as a priority for citizens in the implementation of labour activities, industrial professions felt a significant aggravation of the crisis in human resources [4].

The existing methods and tools of personnel stimulation, which are used in Ukrainian industrial enterprises, are often outdated or ineffective, not flexible enough. These methods do

not take into account modern changing economic conditions and the influence of the employee's personal characteristics on the level of their work productivity [5]. The main distinguishing feature of the personnel incentive system at the enterprises of the Ukrainian industry is the concentration only on material incentives, which leads to an excess of the dynamics of wage growth over the dynamics of labor productivity. Such an outdated approach to motivation is one of the reasons for the constant loss of workers in industry and a decrease in interest in employment among young people, who prefer more flexible and adaptive means of encouraging work and development [6].

**Literature review.** The issue of personnel development through the use of personnel potential has become especially relevant in recent years, when humanity faced large-scale crises that affected all areas of daily life and economic activity, and personnel resources were among the first to face serious problems: a decrease in employees, a decrease in wages, rapid aging methods of motivation, etc. The works by O. Skoruk are devoted to issues of such a category as the formation and development of personnel potential [7], and the potential of the enterprise as a whole as a single system and its development is considered by Sen O., Kovalenko M., Knysh V. [8]. In turn, A. Mashevska [6] considers the experience of foreign countries in the field of personnel stimulation as a possible source of new and more relevant methods of personnel stimulation in today's conditions. L. Zolotukhina and B. Arnautov [9] in their research note the importance of not only stimulating already employed workers, but also ways of encouraging new workers and methods of increasing their loyalty and involvement in the internal affairs of the enterprise.

Among the multitude of world scientists, there is no single algorithm, single methodology for assessing the personnel potential of an enterprise. Thus, S. Sardak and A. Novosyolova [10] consider the process of evaluating personnel and their potential from the financial and economic side, when, in turn, O. Yevteyeva [11] recommends using methods of economic analysis and commonly used approaches and formulas for evaluating the movement of personnel and their composition. A similar approach is inherent to V. Horbokon [12]; however, the researcher recommends using the author's coefficients and more widely analysing the company's personnel system. Lori Wingate and Kelly Robertson suggest using planning techniques to assess the development of personnel potential [13].

Gudz P., Gudz M. and Chernyatin M. [14] propose to evaluate the personnel of the enterprise and the use of their potential, based on the official data of the financial statements of the studied enterprises, while O. Berezhna and O. Kosmina [15] in their works rely mainly on the calculation standard financial and economic indicators of enterprise activity. Also, Donghun Yoon devoted their research to the improvement of the personnel evaluation system at enterprises [16].

Since Ukraine is currently experiencing the strongest crisis in its history due to the full-scale invasion of the Russian Federation, the issue of maintaining and developing personnel during martial law and the search for possible ways of post-war economic recovery are the most urgent areas of research for modern scientists. For example, Y. Kindzerskyi [2] in his scientific study examines the future challenges of the post-war recovery of Ukrainian industry, and O. Boyko and S. Kucherenko [1] pay special attention to the innovative development of modern enterprises. Xiao-yong Zhu and Hua Zhang proposed their own model of coordinated development, which was developed to facilitate the integration of personnel in industrial enterprises [17].

Mechanical engineering was chosen for analysis because of its significant importance for the formation and development of the country's economy and its significant role in the employment market. In his scientific work, Ishchuk S. [18] examines the current problems of the development of mechanical engineering and possible ways to solve them in the context of Ukrainian industry. In turn, Lehovitser V. [19] singles out cer-

tain features of the development of an industrial enterprise in the context of mechanical engineering. On the other hand, Dong Wei and Zhongbing Wang consider the possibilities of intellectualization of the work of personnel at industrial enterprises in order to facilitate working conditions and increase productivity [20].

Among foreign scientists, it is worth paying attention to the works by such scientists as Martin Placek [21], who reviewed international successes in mechanical engineering, and Palina Shauchuk and Kincsö Izsak [22], who prepared a report on modern trends in world mechanical engineering. The development of approaches to personnel management over the past 30 years and the future challenges of personnel management are covered by the work of Christian Grund and Alex Bryson [32], and scientist Nina van Loon investigated the relationship between work motivation and productivity [23].

**The purpose** of this article is to justify the methodology of formation and management of personnel potential of industrial enterprises on the example of the machine-building industry by taking into account the integral indicator of the development of labour resources, which allows modelling the potential income of the studied enterprises based on the optimal use of personnel potential.

**Results.** Mechanical engineering is one of the main strategic factors shaping the economy of any country. Its significant role in the structure of industry is also evidenced by the data of official statistics: mechanical engineering occupies about 20–25 % of the total GDP structure of European countries and about 30–50 % of the total GDP structure of Asian countries [19]. Current trends in the world market of mechanical engineering products indicate the transition of leadership positions from the EU and the USA to the countries of the Asian region (China, Japan, South Korea, etc.). According to the statistics of 2020, almost 30 % of the global machine-building market is occupied by the products of Chinese manufacturers, while Italian and American products occupy about 8 and 7 %, respectively [21].

The conditions for conducting economic activity in the field of mechanical engineering are difficult due to rapid changes in the economy and a decrease in the general desire of young specialists to work in heavy production. Products are becoming technologically more complex, traditional models of business functioning are becoming more complex, and the number of qualified personnel is constantly decreasing due to the digitization and popularization of the IT sphere.

Young people do not want to study and work in industry, because modern "digital" professions provide high wages with much easier working conditions [9]. Therefore, the majority of modern large machine-building enterprises located in the developed countries of the world are currently concentrating either on speeding up technological processes and reducing prices (for example, China), or on creating creative and non-standard types of products (USA) [18].

However, Ukraine still has a long way to go to modernize production and attract as many specialists as possible to increase the competitiveness of national machine-building products [23]. Since during full-scale military operations on the territory of the country, the technological conditions of operation of heavy industry enterprises are changeable and sometimes dangerous, and a large number of young people and specialists left the country, went to the front, or were injured or killed [25], machine-building organizations should focus on the effective use of labour resources available at enterprises and their professional development, that is, it is necessary to concentrate on using their personnel potential.

Despite the fact that the share of mechanical engineering in the structure of the Ukrainian economy is gradually decreasing (for example, in 2022, the volumes of mechanical engineering products sold for export make only about 8 % of the total structure of the export of industrial products [26]), it remains one of the pillars of Ukrainian industry and national

economy in general. Providing the economy of Ukraine with a wide range of mechanical engineering products is carried out by diversifying and developing the production potential and attracting a large number of labour resources.

That is why the mechanical engineering branch was chosen for further analysis as one of the vital ones in the post-war reconstruction of the country. Mechanical engineering currently has the same characteristics that are currently observed in other branches of heavy industry: outdated equipment and technologies, lack of competitiveness in foreign sales markets, a constant decrease in the number of employees and “aging” personnel (disinterest in employment among young specialists and refusal of older workers from changes and innovations), low investment attractiveness, etc. [27]. In general, all these factors form a general picture of the unprofitability of machine-building enterprises and the urgent need for reform and modernization.

For further analysis, the author selected those machine-building enterprises that are currently engaged in economic activity, are active on the market, regularly publish financial statements and have personnel data. Therefore, the following enterprises were chosen for the study:

*Enterprise 1* – PJSC “Novokramatorsk Machine-Building Plant”;

*Enterprise 2* – JSC “DNIPROVAZHMASH”;

*Enterprise 3* – PJSC “Zaporizhzhia Electric Locomotive Repair Plant”;

*Enterprise 4* – PJSC “Kryukiv Carriage Plant”;

*Enterprise 5* – PJSC “Lviv Locomotive Repair Plant”;

*Enterprise 6* – JSC “Kharkiv Machine-Building Plant “Svitlo Shakhtaria”;

*Enterprise 7* – LLC “Ukrelektroaparat”;

*Enterprise 8* – JSC “Berdychiv machine-building plant “Progres”;

*Enterprise 9* – PJSC “Odesa cable factory “Odeskabel”;

*Enterprise 10* – PJSC “Mukachevo Plant “Tochprilad”.

According to the data of the official financial reporting [28], by the end of 2022 only two of the studied enterprises have a profit – the Berdychiv machine-building plant “Progres” and the Mukachiv plant “Tochprilad”. Also, among the enterprises with positive dynamics, we can single out “DNIPROVAZHMASH” and Kryukiv Carriage Plant: despite the losses, compared to the previous period, the total unprofitability of the enterprises decreased by 11.8 and 83.8 %, respectively.

As for personnel, most enterprises are considered small or medium-sized in terms of the number of employees: out of the ten enterprises studied, only two have an average of more than 5,000 employees, “NKMZ” and “Kryukiv Carriage Plant”, all other enterprises do not exceed the limit of 2,000 persons on average. The general employment trends at enterprises of the engineering industry are mostly negative: almost all enterprises during the studied period saw a steady decrease in the number of employees, the most crisis periods can be considered the years 2020 and 2022 – enterprises lost a large number of employees initially due to the COVID-19 pandemic, and then due to the full-scale invasion of the Russian Federation into Ukraine. Positive trends are observed only at the enterprises “Odeskabel” and “Tochprilad” whose staff was either replenished with new employees or remained stable throughout the analysed period.

In the process of the research, performance indicators of the studied enterprises, which are closely related to the personnel of the enterprise and the use of their potential (for example, labour productivity, wage efficiency, etc.), were selected and calculated, and the average salary of the studied enterprises was also calculated. The data of the study indicate a largely heterogeneous picture of the labour productivity of machine-building enterprises [14]. Positive dynamics in recent years have been observed only at three enterprises – “Kryukiv Carriage Plant”, “Tochprilad” and “Progres”; at other enterprises the labour productivity of workers is decreasing. The

biggest decline in labour productivity is observed at the enterprises “DNIPROVAZHMASH”, “NKMZ” and “Ukrelektroaparat”. Also, a strong decrease in productivity in 2022 was recorded at the “LLRZ” enterprise, but the analysis data rather indicates a return to the previous values of labour productivity after a rapid growth in 2021.

As for wages, by 2022, all enterprises have seen an annual increase in average monthly wages within the entire enterprise, which is explained by inflation, Ukraine’s financial difficulties and constant price increases. In 2022, with the onset of a full-scale war, the crisis became much more acute and deeper, but in most of the studied enterprises, the average monthly salary decreased mostly due to significant personnel losses [29].

The results of the calculations show that only four enterprises out of the ten studied have seen an increase in the average monthly salary during the first year of the full-scale invasion of the Russian Federation into Ukraine: “Kryukiv Carriage Plant” (+29.8 % compared to 2021), “Svitlo Shakhtaria” (+21.04 % compared to 2021), “Progres” (+12.96 % compared to 2021) and “Tochprilad” (+2.96 % compared to 2021). The largest decrease in the average monthly salary is noted at the enterprises “DNIPROVAZHMASH” (–50.04 % compared to 2021), “Ukrelektroaparat” (–26.05 % compared to 2021) and “Odeskabel” (–20.82 % compared to 2021). This can be explained by the proximity to the war zone and the loss of workers due to the war (refugees, dead, wounded, internally displaced persons, etc.).

It is also worth paying attention to the ratio of average monthly wages at the studied enterprises and in mechanical engineering as a whole. Most companies pay their employees significantly more than the industry average. The only exception is the enterprise “Progres”, but in 2022 the average monthly salary at the enterprise crossed the limit of the average industry and exceeded it. In turn, “DNIPROVAZHMASH” and “Ukrelektroaparat”, on the contrary, lost a large number of employees and received significant losses, which for the first time in the entire studied period led to a drop in wages at these enterprises below the level of average wages in the field of mechanical engineering. The graphic display of the conducted research is shown in Fig. 1.

On the basis of publicly available financial statements of the enterprises and statistical data, a number of performance indicators of the studied machine-building enterprises were calculated, which relate to the overall efficiency of the management of these enterprises and their use of their personnel potential. The author considered the overall profitability of enterprises, the movement and use of labour, the share of personnel costs in the overall structure of enterprise costs, labour remuneration and its efficiency, etc.

On the basis of the conducted research, the author proposed the distribution of the analysed enterprises according to the “9 Box Talent Matrix” [30], which is actively used in foreign enterprises. To assess the potential, the trends of such indicators as: turnover ratio, profitability, labour efficiency, sustainable growth ratio were taken into account. The calculated values of the labour productivity of the studied enterprises were divided into three groups: “green”, where the productivity was high and constantly increased during the studied period; “blue”, where the level of productivity remained at the same level during the studied period or slightly decreased; “yellow”, where labour productivity has significantly decreased. The “green” group included the enterprises “Tochprilad”, “Svitlo Shakhtaria” and “Odeskabel”, the “blue” group included the enterprises “LLRZ”, “ZEZ”, “DNIPROVAZHMASH” and “Progres” and the “yellow” group included “NKMZ”, “Kryukiv Carriage Plant” and “Ukrelektroaparat”.

At the “Tochprilad” enterprise there is an increase in the number of personnel, the level of productivity and profitability, a constant increase in profitability and independence. Coefficients such as the efficiency of labour remuneration and sustainable growth also have positive dynamics. That is why it

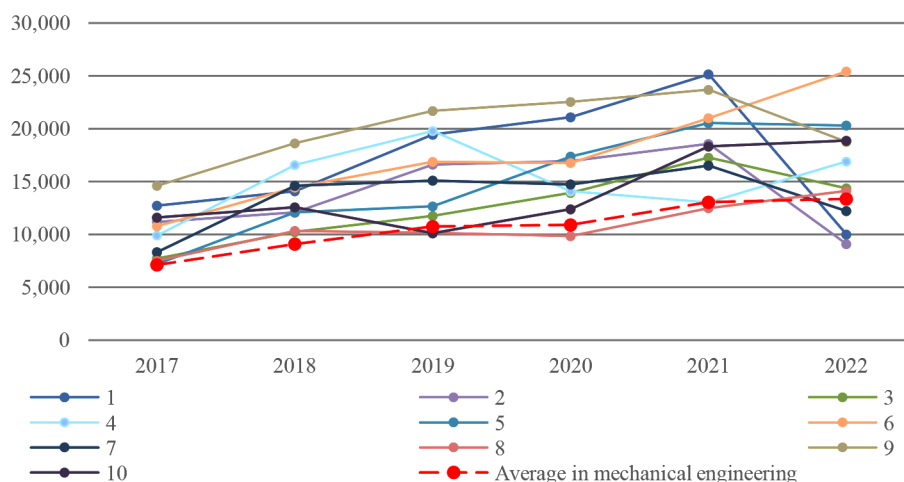


Fig. 1. Comparison of the average monthly salary at the industrial enterprises with the average monthly salary in mechanical engineering in general for 2017–2022

was decided to place the enterprise in the “Star” group, which is characterized by high productivity and high potential.

Enterprises “ZEZ” and “Progres” became representatives of the “High potential” group, where productivity values are average, and development potential is quite high. The enterprise “Progres” is one of two (besides “Tochprilad”) that in 2022 made a profit at the end of the reporting year. Despite a small reduction in staff over the past three years, the company’s productivity has increased, as has the efficiency of labour, but the company’s profitability and sustainable growth rate have decreased significantly. But if labour productivity is gradually increasing at the Tochprilad enterprise, the situation is the opposite at the ZEZ enterprise: productivity grew at a low rate until 2022, but with the beginning of the war it fell to the level of 2018–2019. The number of personnel, which increased during the pandemic, returned to pre-covid values, and in 2022 the company suffered a significant loss. Despite this, the coefficients of labour efficiency and sustainable growth have risen, as has the independence of the enterprise. That is why both companies are considered representatives of the “High Potential” group.

The enterprise “Odeskabel” was recognized as an “effective performer”. Although in 2022 the company’s productivity decreased slightly, it remains the most productive of all: Odeskabel’s labour productivity values exceed the productivity values of the remaining nine companies studied. But the potential of the enterprise remains average, because despite the slight increase in profitability and efficiency of labour, the coefficient of sustainable growth and the profitability of the enterprise are constantly decreasing, as is the number of personnel.

The “LLRZ” enterprise was recognized as a “Main Player”, “Kryukiv Carriage Works” as an “Inconsistent Player”, and “Svitlo Shakhtaria” as a “Reliable Performer”. “Major player” refers to average levels of labour productivity and potential, which accurately characterizes “LLRZ”. The company’s profits had been steadily increasing until the start of the full-scale war, but in 2022 the company suffered a significant loss for the first time since 2017. In recent years, the company’s personnel has also been gradually reduced, which has provoked a decrease in other indicators: productivity, efficiency of labour remuneration, sustainable growth, and profitability. But the company still has the opportunity to regain its leadership position due to its geographical location and a fairly large number of personnel among similar companies in the industry.

“Kryukiv Carriage Plant” was decided to belong to the “Inconsistent player” group, since the company’s labour productivity has been constantly decreasing for almost the entire studied period (the exception was the year 2022), as has the constant

growth rate. Profitability, although still negative, has risen compared to the previous period. Also, the potential of the enterprise was recognized as average due to a small, but increase in the efficiency of labour remuneration and profitability.

“Svitlo Shakhtaria”, despite fairly high and stable values of labour productivity, has a very low potential: the number of employees is constantly decreasing, as well as the profitability of the activity, the efficiency of labour payment, the independence of the enterprise, along with the increase in unprofitability. Therefore, the potential of the enterprise was recognized as low.

The enterprise “DNIPROVAZH MASH” is recognized as a “mediocre player”, because before the start of a full-scale war, the productivity of the enterprise remained at the same level, and in 2022 it decreased sharply, as did the number of personnel. The profitability and efficiency of labour payment at the enterprise are also constantly decreasing, which refers “DNIPROVAZH MASH” to the group of enterprises with low potential.

Two enterprises immediately entered the “Risk” group as organizations with both a low level of productivity and a low development potential – these are “NKMZ” and “Ukrelektroaparat”. “NKMZ” is experiencing difficult times, which intensified with the beginning of a full-scale war due to the geographical location of the enterprise. In 2022, the company lost about half of its employees and for the first time in its activity received a loss as a financial result. Dividend payments decreased by 99.99 %, labour costs by 64 %, productivity by 65.15 %. Also, all other indicators that have an impact on potential have decreased to a large extent – efficiency of labour payment, profitability, sustainable growth and others.

At the “Ukrelektroaparat” enterprise, the situation is not so catastrophic, but the potential is also very low. The number of personnel was constantly reduced during the entire studied period, as was the profitability of the activity. In recent years, productivity and pay efficiency have not had a uniform trend, but in 2022 they have declined significantly, and the rate of sustainable growth has reached an all-time low.

So, the conducted analysis made it possible to conclude that the enterprise with the greatest potential for development should be considered Tochprilad, while the lowest indicators of productivity and potential are observed at the enterprises “NKMZ” and “Ukrelektroaparat”. “DNIPROVAZH MASH” is also in the risk group, and “Progres” and “Odeskabel” should be noted among the potential future “stars”.

A detailed analysis of the components of the researched enterprises’ activities, which relate specifically to personnel and personnel potential, allows one to assess the level of de-



velopment of the personnel potential of these enterprises and to determine possible ways to increase it. The first stage was the determination of the share of personnel development costs in the total amount of personnel costs. Unfortunately, compared to more developed countries, the percentage of personnel development costs at Ukrainian enterprises remains quite low: on average, about 3 % compared to 5–10 % in the USA, 6–8 % in Great Britain and 10–15 % in Japan. Ukrainian enterprises are closer to the positions of the countries of the European Union: about 2–5 % of personnel costs are used for their development in France, Germany, etc. [10].

As for the investigated enterprises of the mechanical engineering industry, thanks to the data of financial reporting and the distribution of enterprises according to the 9 Box matrix, it was possible to establish the approximate values of the share of personnel development costs in the total amount of personnel costs: at the enterprise “Tochprilad” – 3.5 %, at the enterprise “Progres” – 3.2 %, at the enterprises “Odeskabel” and “Svitlo Shakhtaria” – 3 %, at the enterprises “ZEZ” and “LLRZ” – 2.9 %, at the enterprise “DNIPROVAZHMASH” – 2.8 %, at the enterprise “Kryukiv Carriage Plant” – 2.5 %, and at the enterprises “NKMZ” and “Ukrelektroaparat” – only 2 %. For a more successful development of the activities of these enterprises and obtaining a competitive position on the market, it is necessary to increase the costs of personnel development to at least 5 %.

There are many methods and algorithms for calculating indicators related to personnel potential and its assessment. So, for example, researchers V. Grakhov, S. Mokhnachov and V. Frolova propose to use classic indicators of economic analysis and tools such as labour force movement coefficients to analyse the personnel potential, determining whether the personnel at the enterprise is retained or whether its personnel composition is stable [22]. In turn, researchers Berezhna O. and Kosmina O. proposed the author’s indicators that would reflect the assessment of the personnel potential of the enterprise, based mainly on the fund of working hours and the number of employees, as well as their qualifications and age [15]. Sen O., Kovalenko M., Knysh V. offered a wide list of the authors’ coefficients that relate to more abstract concepts, for example, staff loyalty or the level of discipline in the team. But a significant drawback of this approach is the lack of explanation of methods

$$I_{dev} = \frac{\sum K_{qual} \cdot q_1 + \sum K_{retrain} \cdot q_2 + \sum K_{train} \cdot q_3 + \sum K_{prof} \cdot q_4 + \sum K_{rank} \cdot q_5}{\text{Total number of employees of the company}},$$

where  $\sum K_{qual}$  is the total number of employees of the enterprise who have increased their qualification level;  $\sum K_{retrain}$  – the total number of employees of the enterprise who have undergone professional retraining;  $\sum K_{train}$  – the total number of trained employees of the enterprise;  $\sum K_{prof}$  – the total number of employees of the enterprise who have mastered related and/or second professions;  $\sum K_{rank}$  – the total number of employees of the enterprise who have increased their professional rank.

Also, the authors chose the following values of the weight coefficient  $q$  for each of the elements:  $q_1 = 0.5$ , since professional development is the main component of the development of personnel potential;  $q_2 = 0.25$ ;  $q_3 = 0.15$ , since some enterprises include in the list of persons who have undergone training also persons who have passed occupational safety testing at the enterprise (so, for example, at the Kharkiv Machine-Building Plant “Svitlo Shakhtaria” in 2020, 3,275 persons underwent training at the total number of employees is 1,804, that is, some employees passed this test several times);  $q_4 = 0.05$ ;  $q_5 = 0.05$ , since mastering related professions and promotion is considered to be the least important factor of all the factors listed.

for calculating individual components of these authors’ coefficients [8]. The researcher V. Horbokon proposed a large number of author’s indicators, but some of them were only mentioned in his scientific work, while their detailed disclosure would help to better assess the personnel potential. Among them, for example, the coefficient of emotional stability, the reliability of personnel, the coefficient of labour involvement, the indicator of the socio-psychological climate [12].

In general, a large number of domestic and foreign specialists and researchers have created and implemented a significant number of indicators, formulas and coefficients that would help evaluate the human resources potential of the enterprise [31], but most of them have several shortcomings: either the author of the methodology did not explain the algorithm for calculating this or that indicator, or the results of the analysis depend on the subjective assessment of the user of the methodology, or the calculation of indicators is impossible for an external user of the information due to the lack of access to the necessary reporting materials or statistical reports of the analysed enterprise [7]. That is why the author proposed her own methodology for assessing the personnel potential of the enterprise, which is based on the use of official data from the financial statements of enterprises and can be applied to any enterprise regardless of its size, number of personnel and industry. All data for further calculations were taken from open access (financial statements, annual reports of joint-stock companies).

In order to calculate the level of potential human resource capabilities of each of the investigated enterprises, the authors developed their own methodology for determining the level of personnel potential of the enterprise. Having analysed the scientific works by many outstanding domestic scientists and researchers, it is considered expedient to improve the methodology for calculating the personnel potential of the enterprise using the developed integral indicator of the development of the personnel of the enterprise, the indicator of the level of profitability of the staff potential and potential income from the use of the personnel potential at the enterprise.

The authors suggested using the developed integral indicator that characterizes the development of personnel at the enterprise and will be used in the general analysis of the personnel potential of the enterprise for a certain period.

The distribution of the value of the weighting coefficients was carried out by the method of expert evaluations, the results of which are shown in Table 1.

We will use the concordance coefficient. The number of factors  $n = 5$ , the number of experts  $m = 10$ .

$$W = \frac{638.7418}{\frac{1}{12} \cdot 10^2 (5^3 - 5) - 10 \cdot 4} = 0.67.$$

$W = 0.67$  indicates the presence of an average degree of consistency of experts’ opinions. The value is not random, and therefore the obtained results make sense and can be used in further research.

The index of personnel development proposed by the authors is used to calculate the following author’s indicator, which characterizes the level of profitability of personnel potential at the enterprise

$$LPPP = I_{dev} \cdot \overline{Sal} \cdot RS_w \cdot RS_s,$$

where  $I_{dev}$  is the index of personnel development;  $Sal$  – the ratio of the average monthly salary at the enterprise to the average monthly salary in the industry;  $RS_w$  – the ratio of the

Table 1

Distribution of weighting factors by level of importance according to expert assessment

Expert	$q_1$	$q_2$	$q_3$	$q_4$	$q_5$	Sum
Expert 1	0.5	0.25	0.15	0.05	0.05	1
Expert 2	0.5	0.3	0.15	0.03	0.02	1
Expert 3	0.5	0.25	0.15	0.05	0.05	1
Expert 4	0.5	0.25	0.15	0.05	0.05	1
Expert 5	0.55	0.25	0.1	0.05	0.05	1
Expert 6	0.5	0.25	0.15	0.05	0.05	1
Expert 7	0.5	0.25	0.15	0.05	0.05	1
Expert 8	0.5	0.25	0.1	0.05	0.1	1
Expert 9	0.5	0.25	0.15	0.05	0.05	1
Expert 10	0.55	0.3	0.1	0.05	0.0	1
Selected value of the coefficient	0.5	0.25	0.15	0.05	0.05	1

number of employees satisfied with their work to the total number of company personnel;  $RS_s$  – the ratio of the number of employees satisfied with their salary to the total number of company personnel.

Therefore, the author's approach to the development of an indicator of the level of profitability of the company's personnel potential (LPPP) can be used to calculate the lost income from the non-use of the company's personnel potential

$$I_{pot} = LPPP \cdot C_{personnel}$$

where  $LPPP$  is the level of development of personnel potential;  $C_{personnel}$  – the total number of personnel costs.

Table 2 shows the results of the analysis based on the authors' indicators and determines the approximate lost possible income of the studied enterprises, which could be obtained under the condition of effective use of personnel potential.

The data of the analysis indicate that the largest amount of lost income from the studied enterprises was recorded at the enterprises "NKMZ" and "Miner's Light", and the smallest amount of loss of income was determined at the enterprises "Progres" and "Ukrelektroaparat". This does not mean that at those enterprises where the amounts of possible lost incomes are smaller, it is not necessary to engage in the development of personnel and personnel potential, since the calculated amounts of potential losses are based primarily on the

number of employees at the enterprises and on the volume of their incomes. That is why there is such a large gap in potential losses between such enterprises as, for example, "NKMZ" and "Ukrelektroaparat" – after all, at the "NKMZ" enterprise, the average number of personnel and the average amount of revenue for the studied period are 1,200 and 922 % higher, respectively. Therefore, the average amount of lost income from the non-use of the company's personnel potential at the "NKMZ" enterprise is 7,445 % more than at the "Ukrelektroaparat" enterprise.

A comparison of the size of the potentially lost income from the non-use of personnel potential and the revenue of the studied enterprises indicates that the enterprises can receive approximately 3 to 17 percent of their average income from the sale of products (goods, services, works), as shown in Table 3. The smallest possible expenses were recorded at the enterprises "Ukrelektroaparat" and "Kryukiv Carriage Plant" (up to 2 % on average), the possible expenses were recorded at the enterprises "Tochprilad" and "Svitlo Shakhtaria" (about 13–16 %). Fig. 2 shows a graphical display of potential lost income at the studied enterprises.

The data of the analysis indicate that 80 % of the investigated enterprises, provided that the staff potential capabilities are effectively used, could potentially receive an income of an average of up to 8 % of the total amount of income, only at the enterprises "Tochprilad" and "Svitlo Shakhtaria" this income is higher than 10 %, but even 8 % of income on the scale of a large machine-building enterprise is of great importance for the overall financial results.

The more the company invests efforts and funds in the development of its own personnel, the higher the amount of potential income from using its capabilities and increasing productivity. The conducted research shows the heterogeneous dynamics of the volume of lost income from the non-use of personnel potential at the machine-building enterprises of Ukraine. During the pandemic and with the beginning of the full-scale invasion of the Russian Federation, the total revenues of enterprises significantly reduced, which also affected the amount of potential losses from inefficient use of personnel potential.

Therefore, the algorithm developed by the authors for assessing the personnel potential of the enterprise by determining the profitability of the personnel potential and potentially lost income from non-use of personnel can be used at any enterprise, regardless of industry and size, because the only condition for calculation is the availability of financial statements of the enterprise.

**Conclusions.** Mechanical engineering is a driving force in solving the problems of increasing employment of the population, improving labour productivity and the average salary

Table 2

Potentially possible income from the use of personnel potential of industrial enterprises for 2017–2022, thousand UAH

No.	2017	2018	GR, %	2019	GR, %	2020	GR, %	2021	GR, %	2022	GR, %
1	206,229.74	186,598.99	-9.52	310,977.74	66.66	218,556.97	-29.72	256,706.06	17.45	5,068.67	-98.03
2	15,346.34	9,571.83	-37.63	22,981.70	140.10	35,981.35	56.57	21,896.54	-39.14	2,178.74	-90.05
3	5,595.47	16,398.55	193.07	13,057.25	-20.38	7,086.31	-45.73	16,584.14	134.03	21,113.81	27.31
4	29,386.72	101,627.29	245.83	129,034.04	26.97	51,747.95	-59.90	29,958.90	-42.11	57,036.31	90.38
5	22,627.54	21,077.41	-6.85	12,735.12	-39.58	15,393.28	20.87	32,253.96	109.53	35,576.34	10.30
6	44,138.31	93,822.67	112.57	148,415.24	58.19	121,348.98	-18.24	292,334.66	140.90	243,379.26	-16.75
7	6,331.13	16,673.33	163.35	15,154.62	-9.11	19,698.97	29.99	35,478.85	80.11	18,676.92	-47.36
8	2,381.73	5,569.59	133.85	3,932.03	-29.40	1,682.71	-57.21	1,691.82	0.54	435.96	-74.23
9	7,093.84	24,589.23	246.63	16,635.71	-32.35	33,316.30	100.27	51,210.11	53.71	41,340.00	-19.27
10	70,739.48	92,975.26	31.43	111,108.18	19.50	112,165.46	0.95	91,566.34	-18.36	43,501.35	-52.49

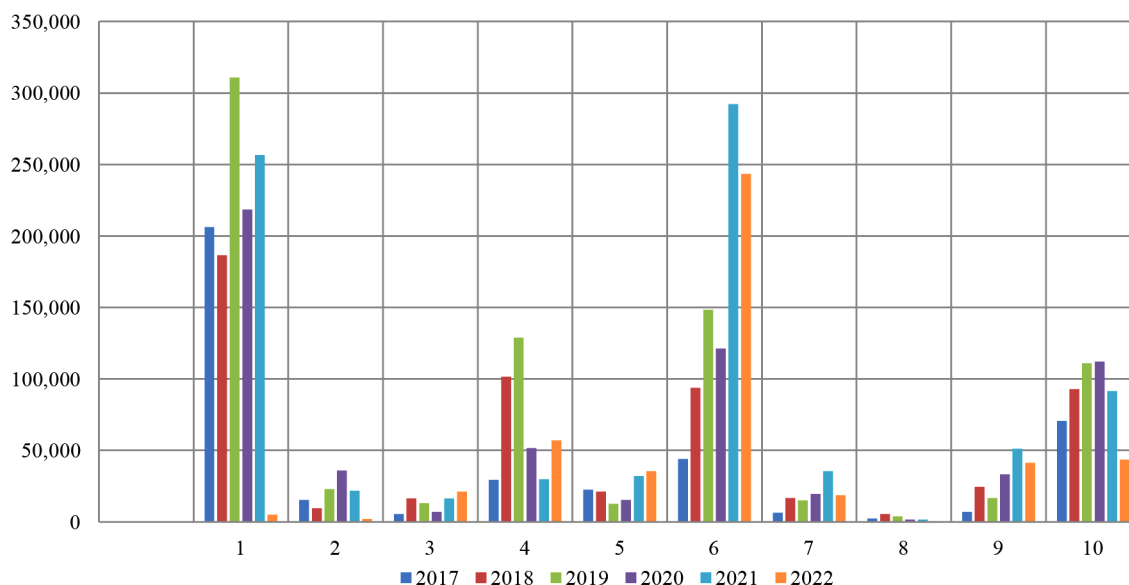


Fig. 2. Lost income from non-use of personnel potential of industrial enterprises for 2017–2022, thousand UAH

of the population. The development of mechanical engineering will allow us to cope with the increase in revenues to the national budget, the improvement of the material and technical base of the country, the rapid development of scientific and technological potential, the activation of foreign economic activity, and in the end – the strengthening of the country's role in the geopolitical processes of the world [33]. In modern economic conditions, it is the development of personnel and the use of their potential that is the main driving force for increasing labour productivity and profitability of organizations, and therefore the authors paid special attention to the current state of personnel potential at large machine-building enterprises of Ukraine, and also developed their own indicators for evaluating personnel potential, which will help the management of organizations, regardless of size and industry, to determine the existing level of personnel potential. Thus, the enterprise, using its own financial statements, has the opportunity not only to calculate standard indicators of the efficiency of economic activity, but also to supplement them with the calculation of the profitability of personnel potential and to determine the amount of possible income that the organization can receive under the condition of effective use of personnel potential. Indicators reflect the level of development of personnel at the enterprise and the value of their potential; therefore, human resources services and the organization's management are able, based on them, to evaluate their own personnel and identify weak points in their development strategy.

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## Кадровий потенціал промислових підприємств: формування та управління

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**Мета.** Встановлення передумов формування системи кадрового потенціалу підприємства й пошук можливих шляхів з її розвитку на прикладі машинобудівних підприємств України.

**Методика.** У дослідженні використовується загальнонаукова методологія: аналіз, синтез, систематизація, метод порівняння. Для розрахунків використані дані фінансової звітності підприємств, що наявні у відкритому доступі. Об’єкт роботи – великі машинобудівні підприємства України.

**Результати.** Проведене детальне дослідження діяльності десяти підприємств машинобудівної галузі України. Проаналізовано наявний стан кадрових ресурсів і факторів, що формують кадровий потенціал підприємства й мають вплив на його розвиток. Запропоновані власні підходи до оцінки кадрового потенціалу.

**Наукова новизна.** Запропоновано комплексний аналітичний інструментарій оцінювання кадрового потенціалу підприємства, що включає інтегральний показник розвитку персоналу, рівень рентабельності кадрового потенціалу та потенційно можливий дохід від використання кадрового потенціалу. На відміну від існуючих методик, використання даного комплексу оцінки усуває залежність результатів від суб’єктивної думки оцінюючого та дає змогу визначити найбільш ефективні напрями удосконалення кадрового потенціалу промислових підприємств.

**Практична значимість.** Результатом роботи є розробка таких авторських показників аналізу кадрового потенціалу підприємства, як індекс розвитку кадрів, рентабельність кадрового потенціалу й величина потенційно можливого доходу від використання кадрового потенціалу. Будь-яке підприємство, незалежно від його розміру, кадрового складу й галузі господарювання, може використовувати дані показники для обчислення наявного рівня кадрового потенціалу.

**Ключові слова:** *кадри, кадровий потенціал, промисловість, машинобудування, продуктивність праці*

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