REALITIES AND PERSPECTIVES FOR HUMAN RESOURCES DEVELOPMENT OF THE CONSTRUCTION SECTOR

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Introduction. The relevance of studying realities and perspectives of human resources development is predetermined by the growing importance of the role and place of man in all socioeconomic processes. At the same time, these studies become significant within certain branches, including the construction industry, which is the main driver of the economic development of the region and the country as a whole.

Aim and tasks. Determining realities and perspectives of human resources development of construction companies, which includes: research of the dynamics of indicators on labor in the field of construction; definition of prediction trends of the basic labour indicators in the construction sector and their predictive values; development of a model which determines the power of influence and interrelation between the level of remuneration and the volume of construction works, as well as enables to determine the number of employees in the construction sector, depending on the values of the selected factors; determining specific features of human resources development in the construction sphere.

Results. The use of dynamics series enables to determine the realities and reveal trends in the sphere of the construction industry, among which we have established the reduced number of employees, increased wages in the construction sphere, the high intensity of migration, increased volumes of construction works, almost the same number of vacancies in absolute terms; by means of economic forecasting methods, we have established optimal predictive equations: the third-order polynomial function for the indicator of the number of employees in the construction industry; the second-order polynomial function for the volume of the construction works performed; the second-order polynomial function for the average monthly remuneration, and we have calculated the predictive values of the main indicators in the work area; regression and correlation analysis enables to reveal the level of interconnection between the number of employees in the construction sphere, the volume of construction works and remuneration, which will determine the number of employees in the construction industry depending on the factors of influence: insignificant, but direct impact on the level of remuneration, and more powerful, but adverse effect of the volume of construction works.

This is the basis for making managerial decisions on the development of human resources in the construction industry. The authors have summarized the peculiarities of the construction industry with regard to the development of human resources in three main directions, namely: peculiarities of personnel training for the sphere of construction, peculiarities of employment and peculiarities of personnel management in the construction industry.

Conclusions. We have established the necessity of further development and improvement of the process of human resources development in the construction industry, from the change of approaches to personnel training and the search for up-to-date and effective methods of personnel management, which, in turn, will lead to positive changes in the construction sphere and, accordingly, will give impetus to the development of the economy as a whole..

Keywords: trend, human resources, company, construction sector, analysis, forecast.

РЕАЛІЇ ТА ПЕРСПЕКТИВИ РОЗВИТКУ КАДРОВОГО ПОТЕНЦІАЛУ ПІДПРИЄМСТВ БУДІВЕЛЬНОЇ ГАЛУЗІ

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Вступ. Актуальність вивчення реалій та перспектив розвитку кадрового потенціалу обумовлено зростаючою важливістю ролі та місця людини в усіх соціально-економічних процесах. При цьому, особливої важливості ці дослідження набувають в галузевих розрізах, в тому числі й в сфері будівництва, яке є визначальним драйвером розвитку економіки регіону та країни в цілому.

Мета і завдання. Визначення реалій та перспектив розвитку кадрового потенціалу підприємств будівельної сфери, що передбачає: дослідження динаміки показників з праці в сфері будівництва; визначення прогнозних трендів основних показників з праці в будівництві та їх прогнозних значень; побудова моделі, яка визначає силу впливу та рівень взаємозв'язку між рівнем оплати праці та обсягами будівельних робіт та дозволяє встановити чисельність зайнятих в будівництві залежно від значень обраних факторів; визначення специфіки формування кадрового потенціалу в будівельній сфері.

Результати. Використання рядів динаміки дозволило визначити реалії та встановити тенденції розвитку сфери праці будівельної галузі, серед яких виявлено скорочення чисельності зайнятих, зростання рівня оплати праці в будівництві, висока інтенсивність міграції, зростання обсягів будівельних робіт, майже незмінна кількість вакансій в абсолютному вираженні; за допомогою методів економічного прогнозування було встановлено оптимальні прогнозні рівняння: поліноміальна функція третього порядку для показника чисельність зайнятих в будівництві; поліноміальна функція другого порядку для обсягу виконаних будівельних робіт; поліноміальна функція другого порядку для середньомісячної заробітної плати та обчислено прогнозні значення основних показників в сфері праці; регресійно-кореляційний аналіз дозволив розкрити рівень взаємозв'язку між чисельністю зайнятих в будівництва та обсягом будівельних робіт і заробітною платою, що дозволить визначати чисельність зайнятих в будівельній галузі залежно від факторів впливу: незначний за силою, але прямий вплив рівня оплати праці та більш сильний, але обернений вплив обсягів будівельних робіт. Вказане є основою для прийняття управлінських рішень щодо формування та розвитку кадрового потенціалу на підприємствах будівельної галузі. Авторами узагальнено специфічні особливості будівельної галузі щодо формування кадрового потенціалу за трьома основними напрямами: особливості підготовки кадрів для сфери будівництва, особливості підбору персоналу та особливості управління персоналом у сфері будівництва.

Висновки. Встановлено необхідність подальшого розвитку та удосконалення процесу формування кадрового потенціалу в будівельній галузі, починаючи від зміни підходів щодо підготовки кадрів і завершуючи пошуком більш сучасних та ефективних методів управління персоналом, що, в свою чергу, призведе до позитивних зрушень в будівництві і, відповідно, надасть поштовх до розвитку економіки в цілому.

Ключові слова: тренд, кадровий потенціал, підприємство, будівництво, аналіз, прогноз.

Introduction. The growing role of man in economic processes predetermines the popularity of research in the field of human management, taking into account the transformational processes and specific character and changing its intended purpose: from labor force and resource to potential and agent of change. Important is the issue of the specific use of a man in the field of construction in view of the importance of this industry and its material, capital and human capacity. The construction industry has historically been one of the leading industries in any country of the world. The average share of construction in the GDP of European countries is about 6%, namely: in the UK − 5.6%, in France and Germany − 7.8%, in Poland − 9%. In Ukraine, unfortunately, the share of construction industry in GDP is decreasing. If in 2008 the share of the construction sector amounted to 5% of GDP of the country, in 2010 it decreased to 3.28%, then, in 2018 it did not exceed 2% [1, 2].

Construction is one of the largest labour markets, since about 7% of the working population of the world is involved in this area. Construction has a large multiplier, as each invested hryvnia attracts 3-4 hryvnias to other sectors. And those who work in these spheres are guaranteed stable work and income. Thus, the construction industry makes a significant contribution to the competitiveness and prosperity of any national economy.

The development of human resources in the construction industry is hampered by a number of problems due to both social and economic situation in the country in general and specific areas of construction (broad specialization of labor, extensive diversification projects, lack of practical training, a significant number of contractors, and so on.). All this leads to the need for a more detailed analysis of the actual state and prospects of development of human resources in the construction industry in order to identify possible ways to overcome the crisis and build a roadmap.

Analysis recent research and publications. It should be noted that the international scientific community uses almost no conceptual and categorical mechanism which is customary for domestic science. All studies on human management in the labor process are considered within the terminology of Human Resource (HR). Therefore, the authors of the study rely on the world scientific achievements in the field of HR-management.

The issue of the interdependence between strategy, personnel management and efficiency, as outlined in work [3], proves the importance of the human factor in ensuring the effectiveness of both the implementation of the strategy and the company as a whole. The above research determines the urgency and timeliness of research in this area. In addition, strategic management of human resources is a factor in ensuring the sustainability of the organization as a whole [4], which is taken into account by the author in determining the essence of the human resources of the company (the author's research [20]).

Research on the human resources of the company, which is one of the manifestations of the totality of employees of the company, is long-lasting and popular in domestic science. Over the entire duration of the Google Academy, more than 18,000 publications are available which directly or indirectly relate to the problem of human resource management. Famous domestic researchers have made significant scientific contribution to the formation of the theoretical basis of human resources, namely: L. D. Garmider [6], N. Heber [7], V. M. Grinyova [8]. The works of these and other authors [9-11] considered both the main theoretical positions of understanding the human resources at all hierarchical stages of the socio-economic system and the problems of management at the company level.

It should be noted that research in the field of theoretical and methodological foundations of human resources management with regard to the construction sector peculiarities is rather limited. The works of such scientists as L. O. Bohinska [12], K. A. Mamonov [13], O. O. Uhodnikova [14], D. R. Emirbekova [15] are devoted to the evaluation, analysis and effectiveness of the use of human resources of construction companies. An important factor in improving the efficiency of the construction industry is the formation and development of human resources. Over the previous 10 years considerable attention is paid to the development of human resources potential of construction companies by such researchers as A. Kovalenko, G. Kotsalap and A. V. Belyaev [16], and, to some extent, K. Spiridonova [17].

Work [18] is devoted to the problem of specific features of human resources management in the construction sector, as well as to those negative consequences, which may arise if one fails to take into account the distinctive features of the construction industry.

Author's research in this field enables to understand the essence of the human resources of the company as a complex, dynamic, open socio-economic system, which is represented by the set of abilities and capabilities of the personnel of the company having quantitative and qualitative characteristics necessary for the company's sustainable development [5]. The quantitative and qualitative characteristics of the human resources predetermine the necessity to study the number of employees in the field of construction as a quantitative basis for its development.

However, in today's dynamic environment, the issue of analysis, evaluation, forecasting and specific character of the formation of a numerical basis of human resources of companies in the construction

industry remains relevant and topical, which leads to the choice of the purpose of the study.

Aim and tasks. The aim of the article is to reveal the realities and perspectives of human resources development of construction companies.

Results. The authors have selected a number of indicators in the field of construction, which reflect the number of employees and vacancies, the level of remuneration and results of activities in the form of the volume of construction works. The indicators are analyzed using chain and reference series of dynamics and in comparison with the average ones in the country as a whole (Table 1).

The analysis of the main indicators in the field of labor, as well as the dynamics of economic development of the construction sector, which is revealed through the volume of the construction works, enable to formulate such conclusions regarding the quantitative basis of human resources in the field of construction and to identify the main trends.

Table 1. Analysis of the dynamics of labor efficiency indicators in the field of construction

Name	Years						Basic rate of growth, %
	2012	2013	2014	2015	2016	2017	
Number of employees, ths. persons							
- Ukraine, total	19,261.40	19,314.2	18,073.30	16,443.20	16,276.90	16,156.40	-16.12
Chain growth rates, %	-	0.27	-6.42	-9.02	-1.01	-0.74	-
- construction sector	836,40	841,10	746,40	642,10	644,50	644,30	-22,97
Chain growth rates, %	-	0,56	-11,26	-13,97	0,37	-0,03	-
Average monthly remuneration, UAH							
- Ukraine, total	3,041.00	3,282.00	3,480.00	4,195.00	5,183.00	7,104.00	133.61
Chain growth rates, %	-	7.93	6.03	20.55	23.55	37.06	-
- construction sector	2,543.00	2,727.00	2,860.00	3,551.00	4,731.00	6,251.00	145.81
Chain growth rates, %	-	7.24	4.88	24.16	33.23	32.13	-
The ratio of the average monthly remuneration in the construction sector to the average one in Ukraine,%	83.62	83.09	82.18	84.65	91.28	87.99	-
Volume of construction works, mln. UAH	62,937.20	58,586.20	51,108.70	57,515.00	73,726.90	105,682.80	67.92
Chain growth rates, %	-	-6.91	-12.76	12.53	28.19	43.34	-
The total area of housing commissioned, ths. M^2	9,770	9,949	9,741	11,044	9,367	10,206	4.46
Chain growth rates, %	12.5	1.8	-2.1	13.4	-15.2	9.0	-
Labour efficiency in the construction sector*, ths. UAH/person	75.24	69.65	68.47	89.57	114.39	164.02	117.98
Chain growth rates, %	-	-7.43	-1.70	30.81	27.71	43.39	-
Number of vacancies, total (January-December), ths. units.	48.6	47.5	35.3	25.9	36	50.4	3.70
- construction sector	2.2	2.5	1.3	1.0	1.8	2.2	-
Vacancies (units) per 1,000 employees	2.6	3.0	1.7	1.6	2.8	3.4	

* - calculated as the ratio of the volume of construction works to the number of employees in the construction sector
Source: developed and calculated by the authors on the basis of work [19].

First of all, the negative tendency to reduce the number of employees in the construction sector should be noted (-22.97% over the analytical period). It is consistent with the national tendency, but with a higher drop (-16.12% in Ukraine).

The opposite dynamics is shown by an important indicator in the field of labour − its level of payment − which is growing at a higher rate in the construction sphere (+ 145.81%) than in Ukraine as a whole (+ 133.61%). At the same time, the remuneration level in the construction industry is lower (throughout the analytical period) compared to the national one (ranging from 83.62% to 87.99% with a maximum value of 91.28% in 2016).

This dynamics shows that the remuneration level in the construction sector is rather low compared to other spheres, and fails to play a sufficient motivational role, which contributes to the depletion of human resources through labor migration abroad.

According to the Employment Agency of Ukraine [20], pursuant to the form No. 1-PA "Information on the number of the employed citizens by business entities which provide employment mediation services and hire workers for further employment by other employers in Ukraine", as well as excerpts of the Employment Agency of Ukraine from the Automated Accounting System of Permits for the use of labor of foreigners and stateless persons, by the types of economic activity, before leaving abroad, more than a third of migrant workers from Ukraine worked in transport, warehousing, postal and courier activities (37.2%) spheres, as well as in manufacturing (10%) and construction (10%) sectors.

At the same time, it should be noted that if the volume of construction works increases, including the housing commissioned in natural metrics (+ 4.46%), we observe the reduced employment in this area. Accordingly, we have a growing tendency of labor efficiency (+ 117.98%), both due to the increased volumes and the reduced employment.

The compared growth rates of labor efficiency and the remuneration level show that in 2013-2014, the increased remuneration level was predetermined by inflationary processes and actions of the state with regard to the level of minimum wages rather than by economic factors, as the efficiency had negative growth rates. But already in 2015 and 2017 the growth of labor efficiency outstrips the increased remuneration level, which is explained by economic factors, namely: the increased volume of construction works.

The dynamics of vacancies in the construction sector and in Ukraine as a whole is ambiguous in our opinion. If the latter shows a tendency to increase, which indicates the staff shortage of the Ukrainian economy, then the number of vacancies in the construction sector is characterized by a declining tendency in 2014-2016. At the same time, the number of vacancies per thousand employees is increasing.

It should be noted that there is some time lag in the economic processes in the field of construction with some impact on labor indicators. Thus, the reduced volume of construction works in 2013 by 6.91% was one of the reasons for the reduced number of employees in 2014 by 11.26%.

Nowadays, there is a disproportion in the significant indicators of the volume of construction works performed, the number of employees and vacancies in the construction industry, namely: the higher construction volumes, the lower number of employees and the higher number of vacancies. The study makes it clear that in the coming years the situation will improve somewhat, with no significant changes in employment of the construction sector.

Methods of economic forecasting enable to determine the optimal equations of trends of the main indicators of labour in the construction industry (Table 2).

Table 2. Forecast trends of the main indicators of labor in the construction industry

Name	Forecast equation	Determination coefficient (R^2)
Number of employees, ths. persons	$y = 7,712x^3 - 74,478x^2 + 151,71x + 757,57$	$R^2 = 0,9639$
Volume of construction works, mln. UAH	$y = 4933,8x^2 - 26949x + 87753$	$R^2 = 0,9767$
Average monthly remuneration, UAH	$y = 194,07x^2 - 637,27x + 3064,2$	$R^2 = 0,9963$

Source: Authors' calculations.

Having compared the forecasting equation by different functions, the functions with determination coefficient approximating the highest probability values were selected.

They are: the third-order polynomial function for the number of employees in the construction sector ($R^2 = 0.9639$); second-order polynomial function for the volume of the construction works performed ($R^2 = 0.9767$); second-order polynomial function for the average monthly remuneration ($R^2 = 0.9963$). These functions enable us to determine the forecast values of the labor efficiency indicators in the construction industry (Table 3).

Table 3. Forecast indicators of labor in the construction sector

Name	Forecast year 1	Forecast year 2	Forecast year 3
Number of employees, ths. persons	815,334	1153,202	1712,29
Volume of construction works, mln. UAH	140866,2	187924,2	244849,8
Average monthly remuneration, UAH	8112,74	10386,52	13048,44

Source: calculated by the authors on the basis of data Table 2.

Figure 1 shows the generalized growth rates of the main indicators of labor in the construction sector, taking into account the motivation factors.

Thus, the number of employees in the construction sector is influenced by the factors which characterize the economic activity in the industry, as well as the factors of a motivational nature which make it attractive for labor.
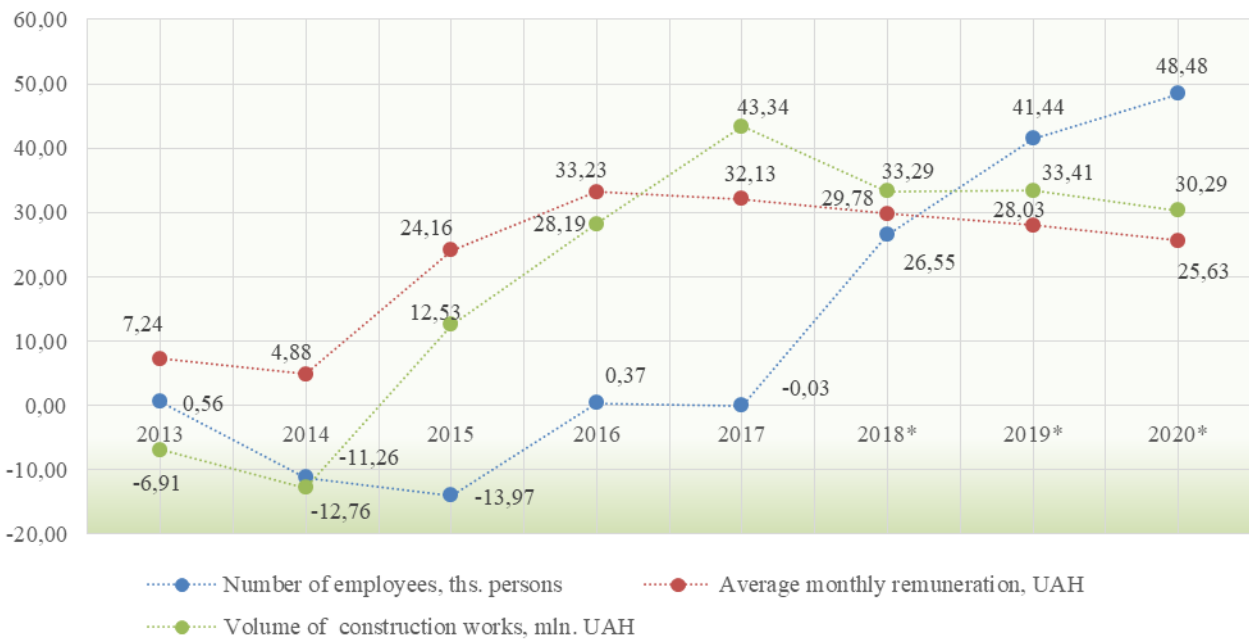

Fig. 1. Chain growth rates of labor indicators in the construction sector, %
Source: developed by the authors on the basis of Table 1.

The indicator which determines the activity in the construction sector is the volume of construction works, with the payment level as a motivation indicator.

Thus, one can consider the hypothesis that the volume of construction work and the remuneration level affect the number of employees in the construction sector as a quantitative basis of human resources, which enables to develop a model of the dependence of the number of employees in the construction industry on the identified factors, as well as to determine the future level of the quantitative basis for the human resources of companies. For this purpose it is expedient to use a correlation and regression analysis.

In accordance with the objective of the study, having determined the number of employees (*y*) in the construction sector as the effective indicator, and the volume of construction works (*x1*) and the average remuneration level (*x2*) as the affecting factors,

using the methods of regression analysis, we will construct a model which determines their power of influence and level of interdependence, as well as to reveal the number of employees in the construction industry, depending on the values of the selected factors. Data from Table 1 are taken as out-coming data. The equation is as follows:

$$y = 769,341 - 0,141 \times x_1 + 0,007 \times x_2$$

The model needs validation verification. The most general estimate in this case is provided by the correlation and determination coefficients. We evaluate the interdependence between the factors (x_i) and the result (y) using the multiple correlation coefficient and determination coefficient (R^2). Based on regression statistics, we can state that the model is reliable: the correlation coefficient (R) is: $R = 0,9572$, which indicates a very strong correlation (0.97-0.99 according to the Chaddock scale: the connection is very strong), the determination coefficient also has a value close to 1 ($R^2 = 0,9164$). Therefore, the data provided for by the model will be consistent with the reality, or 91.64% of change in the output variable is determined by the influence of input variables.

Further Fischer test (F) showed that $F_{act} > F_{table}$ (16,446>6,944), i.e. R^2 and the regression equation in general, are statistically significant with a reliability of 95%.

Another criterion for checking regression models is the Student's criterion (t-criterion). Values of the t-criterion: at $\alpha = 0,05$ is $t = 2,776$. The estimated value of the t-criterion should be more than the table one for the linear correlation coefficient to be considered statistically significant ($|t_{act}|>t_{crit}$). Testing by the Student's criterion showed statistical significance of the regression equation criteria.

The model developed on the basis of the multiple regression and tested according to the Fisher and Student criteria, is adequate and characterizes the influence of these factors on the final result. We should point out more powerful, compared to remuneration, the inverse effect of the volume of construction works on the number of employees, which correlates with the trends detected pursuant to the dynamics. The remuneration level has an insignificant but direct impact on the number of employees in construction companies. In other words, the increased remuneration will enable to withhold human resource from going abroad, and we should take this fact into account when forming the system of motivation.

The model enables to predict the number of employees in the construction industry depending on the factors of influence, and is the basis for making managerial decisions on the formation and development of human resources in the construction industry.

The analysis of statistical and calculation indicators, as well as previous studies of economists, makes it possible to generalize the peculiarities of the construction industry with respect to the formation of human resources in three main areas, namely: peculiarities of personnel training for the sphere of construction, peculiarities of employment and peculiarities of personnel management in the field of construction (Fig. 2).

The peculiarities of the formation of human resources in the field of construction are based, first of all, on the specific characteristics of the construction industry itself, such as the unique character of the overwhelming majority of construction objects; considerable duration of implementation of construction projects; the dependence of a significant part of the work on weather conditions; significant duration of construction (usually over 1 year); a large number of participants; a complex process of document management; a long life cycle of construction products (may be over 100 years) in conjunction with the necessity to ensure the operation safety of constructed facilities throughout the cycle; multi-stage implementation of construction projects.

The process of human resource development itself involves three main stages. At the first stage, training is carried out, i.e., of future specialists in the field of construction. The involvement of building organizations in this process is often indirect, although the industry's specific character requires constant collaboration between educational institutions and employers for better training of future builders.
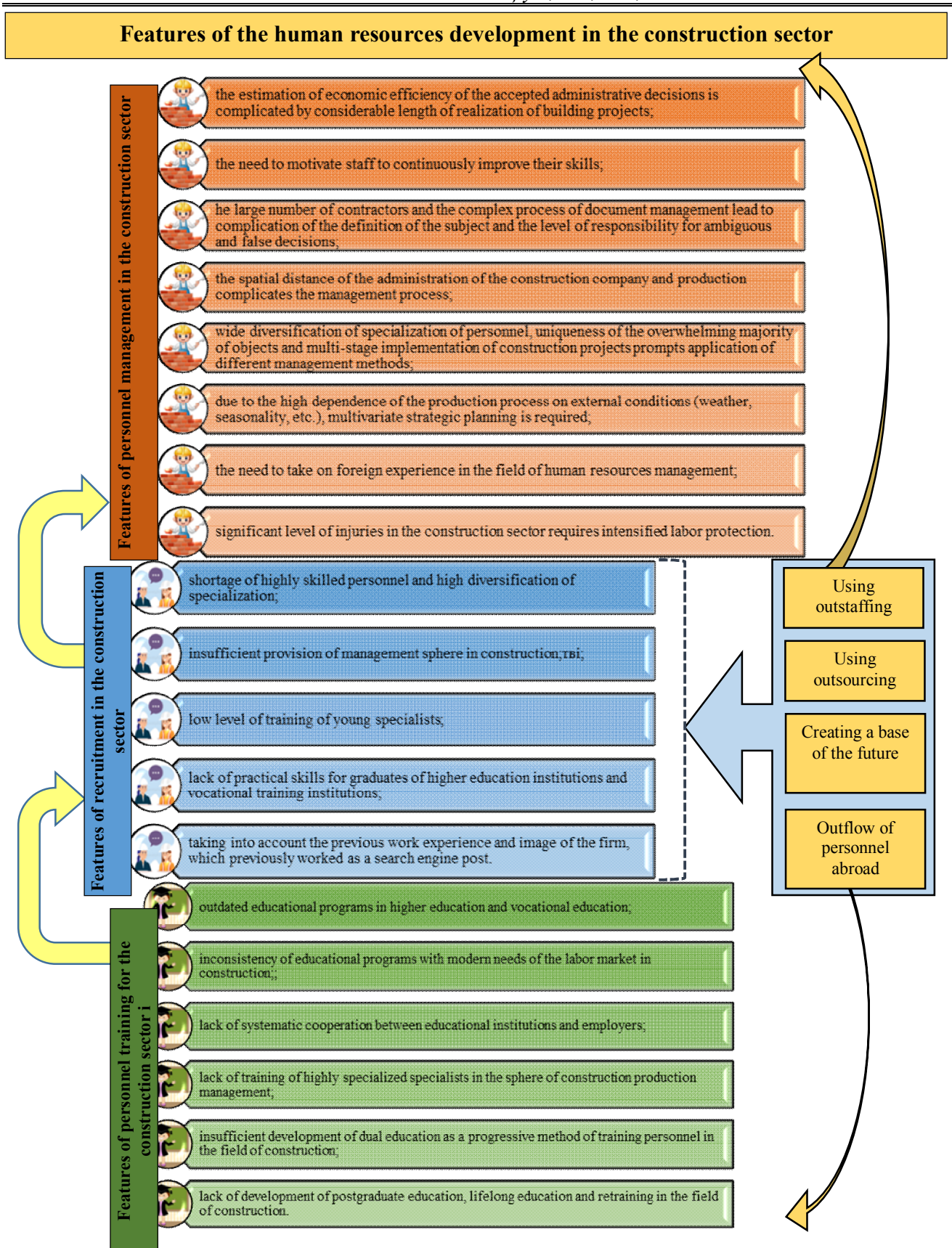
Fig. 1. Features of the human resources development in the construction sector
Source: developed by the authors on the basis of works [16, 21].

In general, the education system in the field of construction requires updating educational programs, linking them to existing technologies, mostly thorough practical training with the introduction of dual education and forming the basis of the future (direct work with the student audience).

According to the State Employment Agency [20], representatives of trade jobs and specialists in the field of construction and architecture have consistently been among the most sought-after personnel in the labor market for the previous few years. For example, as of September 1, 2018, only one applicant is required for one vacancy among skilled workers, with two applicants for such job even a year ago.

The shortage of personnel is confirmed by representatives of the construction sector. The first reason is the labour outflow abroad. But experts predict that such a massive outflow, which was observed with the provision of a visa-free regime to Ukraine, will not occur in the near future, with the situation stabilizing.

It is obvious that the peculiar features and negative phenomena of the first stage of the human resources development in the construction industry, i.e., training personnel, have a direct impact on the selection of personnel for construction companies. However, the relatively new methods of employment in Ukraine (outsourcing, outstaffing) provide an opportunity not only for saving money but also for the increased efficiency of the production process and reduced duration of works. The peculiarities of personnel management in the construction sector reflect the complexity and specific character of the industry as a whole, with the tangible influence of the previous stages.

Conclusion. Using dynamics series enables to determine the real situation and to establish trends of development of the construction industry, namely: reduced number of employees in the construction sector (-22.97% for the analytical period), corresponding to the national tendency, but with higher drop; increased remuneration level at a higher rate in the construction sector (+145.81%) than in Ukraine as a whole (+133.61%); increased volumes of construction works performed (+67,92%), including the housing commissioned in natural metrics (+4,46%).

Using the methods of economic forecasting we have revealed optimal predictive equation (those functions the coefficient of determination of which approximates the value with the highest probability): the third-order polynomial function for the number of employees in the construction sector (R^2 = 0.9639); second-order polynomial function for the construction works performed (R^2 = 0.9767); second-order polynomial function for the average monthly remuneration (R^2 = 0.9963).

The following hypothesis has been considered. The formation of employment in the construction industry as a quantitative basis of human resources is influenced by the volume of construction works and remuneration level, enabling to build a model of dependence on the number of employees in companies of the construction sphere, according to the factors, and to determine the future level of the quantitative basis for the personnel of the companies. Regression and correlation analysis enabled to reveal the level of interconnection between the number of employees in the construction sector and the volume of construction works and remuneration. The model based on multiple regression and tested according to the criteria of Fisher $F_{act} > F_{table}$ ($16,446 > 6,944$) and Student ($t_{act}|>t_{crit}$) is adequate and describes the impact of the above factors on the outcome.

It should be noted that there is stronger (0.141), as compared to remuneration (0.007), negative effect of the volume of construction works on the number of employees which correlates with detected trends, based on dynamic series. The remuneration level has insignificant, but direct impact on the number of employees in construction companies. In other words, the increased remuneration will enable to withhold human resource from going abroad, and we should take this fact into account when developing the system of motivation.

In the research the specific features of the construction industry with regard to the human resources development in three main areas, namely: peculiarities of personnel training for the sphere of construction, peculiarities of employment and peculiarities of personnel management in the field of construction have been summarized. All the above facts make it possible to conclude on the necessity for further improvement of the process of developing human resources in the construction industry, namely: changing approaches to training and seeking for up-to-date and effective methods of personnel management, which, in turn, will lead to positive changes in the construction industry, and, accordingly, will give an impetus to the development of the economy as a whole.

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