Evaluating the effectiveness of investment in human capital in the context of digitalization: Ukraine and the European Union

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Abstract: The effectiveness of entrepreneurial activity is in the ability to provide not only the positive dynamics of financial and economic performance, but also to address the issue of investing in the formation and development of human capital at the enterprise. The purpose of this article is to study the methodological and organizational approaches to ensuring rational investment in human capital in adaptive terms to processes of digitalization of sustainable development of Ukraine and the European Union. Investments in human capital can be made according to several directions: social (voluntary medical and pension insurance of employees, social benefits for certain categories of employees), health care (payment of medical care, preventive measures and medical examination, financing of physical education and sports) and education (covering expenses for the participation of employees in seminars, conferences, and qualification upgrade courses). Although the final indicators of business and education are completely polar, it is reasonable to consider the assessment of investing in human capital in terms of the effectiveness of these processes. To assess the effectiveness of investment in human capital, a number of methods were considered. Our study of the data provided by the Ukrainian public joint-stock companies in the Management Report for 2019 (information posted on the websites of corresponding companies) confirmed the interest of business entities in supporting the policy of investing in human capital.

Key words: human capital, investment in human capital, digitalization of the economy.

JEL: J24, C13, M48, O15.

Introduction

Among the determinative directions of socio-economic development of countries, there is a new paradigm of the theory of "post-industrial society" as a society, the economy of which is dominated by an innovative sector with high-performance industry, knowledge industry, a big share of high-quality and innovative services in GDP, and a higher percentage of population engaged in the tertiary sector than in the industrial production. The traits

of innovative socio-economic development are formed decisively under the influence of high technology, and they need clarification in the assessment of rapid transformations of forms, directions, and consequences.

"Digital economy" or "on-demand economy" – these are the terms that describe modern trends in the development of economic and information relations. In general, these terms identify the type of economy, where digital data, both numerical and textual, are the key means of production. The "digital vortex" created by digital technologies opens up unique opportunities for the development of the state economy and improving the living standards of the citizens.

With a systematic statecraft approach, "digital" technologies will boost the development of an open information society as one of the essential factors needed to increase productivity, ensure economic growth, create jobs, and improve the living standards of the citizens.

The key principles of digitalization in the state economy, which determine its avant-garde nature, are presented in Table 1.

Table 1. Basic principles of digitalization of the economy, which determine its avant-garde nature

Principles	Contents and synopsis of the principles in digitalization of the economy
Accessibility	"Digitalization" should provide every citizen with equal access to services, information and knowledge provided on the basis of information and communication technologies. Removing barriers is a key factor in expanding access to the global information environment and knowledge.
Focus	"Digitalization" should be aimed at creating advantages (benefits) in various aspects of everyday life.
"Growth area"	"Digitalization" is a mechanism (platform) of economic growth due to the cumulative gain in efficiency and increased productivity from the use of digital technologies. Such growth is possible only when the ideas, actions, initiatives and programs related to "digitization" are fully integrated into national and regional development strategies and programs.
Freedom of the press, information. Independence. Diversity of media	"Digitalization" of the state should promote development of the information society, the media, and the "creative" environment. Creating content in accordance with the national or regional needs should contribute to social, cultural and economic development, as well as strengthening of the information society.
Openness and cooperation	"Digitalization" should be oriented at the international, European and regional cooperation in order to integrate into the world community, enter the European and world market of e-commerce and services, banking and stock exchange activities, cooperation and interaction in regional markets.

Standardization	The standards increase competition, allow reducing expenditures and product cost, guarantee compatibility, maintain quality, and increase the state GDP. E-commerce systems, stock and financial markets, etc. must comply with the international and European standards.
Trust and safety	Establishing trust, in particular based on information security, cybersecurity, personal data confidentiality protection, privacy and protection of the rights of ICT users, is a prerequisite for the simultaneous development and security of "digitalization".
Focus and integration	Government control should play a leading role in the development, promotion, and implementation of comprehensive national "digital" strategies. Government control should focus on removing barriers on the way to the "digitalization" of the country, correcting defects in market mechanisms, maintaining fair competition, and attracting investments.

Source: own elaboration, based on Kraus & Holoborodko (2018)

Research on qualitative manifestations in the labor markets of artificial intelligence receives an especially active founding: artificial perception is perceived by many as an engine of productivity and economic growth, a factor in improving the efficiency of decision-making processes, a real chance of analyzing large numbers, etc. At the same time, even today, artificial intelligence confirms the need for careful search for tools that can ensure its socially useful adaptation to economic realities (otherwise, it can have a negative and destructive impact on both the economy and society as a whole).

Therefore, it is impossible to disregard the other side of technological development - people's working capacity, upgrading their qualification. Reduction of jobs, unwillingness of certain professions to compete with technological substitutes for the presence of labor in the workplace, elimination of human "emotional, psychological, aesthetic impact on the finished product, which the buyer in the market expects" – under the modern conditions of economic transformations, these are the objects of profound research.

From the middle of the 20th century, the issues of intellectualization of production, organization and management of intellectual labor have been given more and more attention, since such work not only allows creating and accumulating the intellectual capital, but it also significantly changes the characteristics and value of other kinds of capital (materials, machines, services, business processes). Under the conditions of modern economic orientations, everything indicates that the sources of profitability of an enterprise, ensuring high added value, and increasing competitiveness are not quantitative factors and tangible assets, but knowledge and intangible factors, namely: intellectual, social, and human capital, as well as innovation in marketing and management, which provide conditions and

opportunities for the creation, implementation and use of information and communication, digital and smart technologies.

In our opinion, the existing composition of accounting objects should be expanded at the expense of the so-called "objects of the digital economy", which significantly affect the formation of the financial result - its distribution. Among such objects of accounting, first of all, it is necessary to allocate intellectual capital. In the work of Swedish scientists Leif Edvinson and Michael Malone, "Intellectual capital. Determining the real value of the company", which was one of the first to cover this scientific problem and is recognized worldwide, the components of intellectual capital are human, organizational and client capital [Edvinsson & Malone, 1997].

In the future, human capital will be able to influence the socio-economic climate of the countries that invest in the development of regional infrastructure. From a philosophical perspective, modernization and dynamic development of the state present a systemic change in the physical, institutional, organizational, intangible (intellectual), financial and other factors of its functioning. One can state with confidence that they ultimately lead to a positive economic, social, political, institutional, environmental, and infrastructural outcome [Korchahin, 2016].

Theoretical premises

Formation of human capital as an object of study has been relevant for a long time. Due to this, interest in this economic asset has undergone certain transformations. Adam Smith, Karl Marx, and many other authoritative economists and philosophers referred to this.

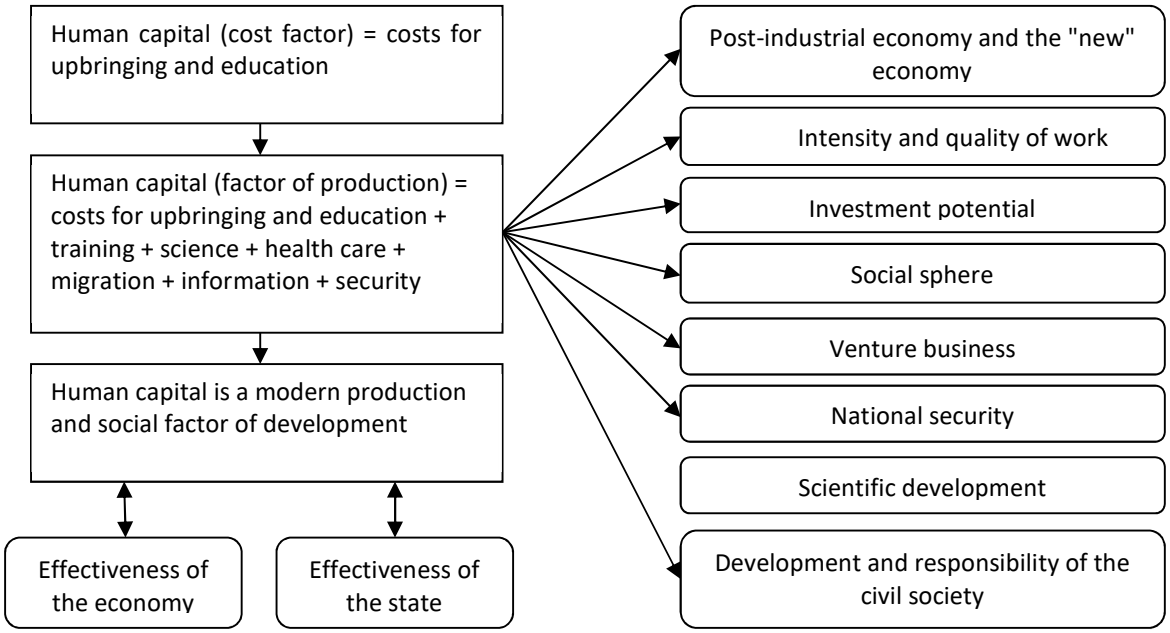
T. Schultz offered various approaches to defining the essence and role of human capital, which made a significant contribution to the formation of the theoretical fundamentals of this concept at the initial stage. It is owing to his research that this economic tool has been rethought and popularized. Schultz defined the role of human capital as a fundamental element of the industrial and, later on, post-industrial economy [Schultz, 1963].

A multi-layered concept of "human capital" at the micro level was suggested by G. Becker in the 1960s. He interprets "human capital" as a set of knowledge, skills and abilities. Expenditures on education and training, according to G. Becker, are investments in human capital development. First of all, he assessed the economic efficiency of education directly for

an individual. The researcher identified the difference in the income of a person with higher education and a poorly educated employee as a potential income difference [Brik & Goreltsev, 2014].

Transformation of approaches to the interpretation of the concept "human capital" in a historical retrospect is shown in Figure 1.

Figure 1. Transformation in the approaches to the interpretation of the concept "human capital" in a historical retrospect



Source: own elaboration, based on Kapkaev & Nurmukhametov (2019)

Following the example of the European Union, modern Ukraine is moving to a fundamentally new type of development - innovative social development based on knowledge, education, intellectual and educational human potential. The country is entering a new phase of formation and application of the human potential, when an increase in the social wealth progressively depends on human abilities to create new knowledge, systematize and generate innovations, design innovative projects, create conditions for rapid economic growth and market development based on dynamic upgrade of the technologies and produced material and spiritual wealth.

The effectiveness of entrepreneurial activity is in the ability to provide not only the positive dynamics of financial and economic performance, but also to address the issue of investing in the formation and development of human capital at the enterprise. The

rationality of building a management system with the use of modern trends in the digitization of sustainable national development encourages managers to seek balanced solutions, obtained on the basis of the results of certain forecast evaluations. Restrictions in the financial support provided to these areas are especially evident today in the context of the just another restriction related to the control of the COVID-19 pandemic. The research offers an alternative to such "management logistics" with the use of complex information content based on the data from analytical studies of progressive business practices in the content of introducing modern systems of production intellectualization.

Methodology

To achieve the goal set in the research, it applies general scientific and special methods based on the systematic study of economic phenomena, namely: systematic and comprehensive analysis, scientific generalization, historical method, comparison and method of analogies – in the study of modern economic theories and works of domestic and foreign scholars on the essence of the concept “intellectualization of entrepreneurship”, “digitalization of sustainable development”; methods of concretization, generalization of theoretical and practical material, analysis – to solve problems in the process of successful investment in human capital; methods of scientific abstraction, a normative method, a method of coefficients, methods of induction and deduction – to form an effective justification for assessing the impact of investing in human capital as an integral condition of present-day business development.

Results

According to the Global Innovation Index (GII), in 2020, Ukraine ranked 45th among 131 countries of the world. And according to the sub-index of innovations, which defines the state of development of human capital and research - 39th place in the ranking [The Global Innovation Index 2020: Who Will Finance Innovation?, 2020].

The increasing attention to the processes of digitalization has been transformed into a significant number of methodological approaches to its evaluation with the use of relevant indices and ratings of countries in terms of the economy digitalization as a whole or its certain aspects only. The most popular indices in the assessment today are:

- The ICT Development Index − IDI: is calculated and made public by the International Telecommunication Union, a specialized unit of the United Nations Organization in the field of information and communication technologies (International Telecommunication Union, 2019);
- Digital Economy and Society Index, DESI: is formed by the European Commission (European Commission, 2019a);
- The IMD World Digital Competitiveness Ranking: is established by the IMD World Competitiveness Center (IMD World Competitiveness Center, 2019);
- Enabling Digitalization Index − EDI: is calculated by the insurance and consulting company Euler Hermes out of the German financial multinational corporation Allianz (Euler Hermes, 2019);
- The Government Artificial Intelligence Readiness Index: is established by the English organization Oxford Insights (Miller & Stirling, 2020) [Vyshnevskyi, 2020].

Among the international ratings and studies of the level of informatization and readiness for the information society and e-government, the most authoritative are the following:

1) network readiness index (NRI);
2) e-government readiness index (EGDI);
3) ICT Development Index (Information and Communication Technologies) (IDI);
4) Knowledge Economy Index (KEI) [Panasiuk 2020].

This list is not exhaustive; nevertheless, it fully confirms the thesis of a fairly large number of approaches to both the assessment of digitalization and the extension of such processes to the human capital modification.

Unfortunately, taking into account the imbalance of budget funds (there are still active military actions in the territories of Ukraine, there are significant deductions from state reserves to control the COVID – 19 pandemic, etc.), it is complicated to specify the reference points of implementing the principles of "intellectualization" in the area of production for Ukraine, compared to the EU countries, although such an ideology is getting more and more popular both at the level of research and at the level of governmental program tasks (Table 2).

Table 2. Characteristics of individual European countries according to the economic complexity and welfare (data for the year 2018) and prospects for economic growth until 2027

Country	Ranking per capita income (out of 133 countries)		Average GDP per capita for the last 5 years, %	GDP per capita for PPP, USD	Ranking of the countries according to the index of economic complexity (ECI)	Forecast of the economic growth until 2027 on the annual basis	
	Income level	Ranking among the richest economies				Growth rate	%
Switzerland	high	1	0.7	66299	2	slow	2.4
Germany	high	14	1.2	52574	4	slow	2.0
The Czech Republic	high	31	2.7	38019	6	slow	2.3
Italy	high	22	0.1	40981	13	slow	1.9
Great Britain	high	19	1.5	44896	14	moderate	3.0
Poland	high	44	3.3	29930	21	moderate	3.1
Norway	high	2	0.6	62182	41	slow	2.5
Turkey	above average	49	4.3	27878	38	moderate	4.64
Ukraine	below average	96	-1.0	8693	42	slow	2.4

Source: own elaboration, based on The Atlas of Economic Complexity (2019)

Simultaneously, it is absolutely inevitable that the high-tech digital economy is being formed both in Ukraine and in the EU countries, acquiring certain identifying features, in particular:

- domination of the information and network sector of the economy over the economy of services, use of new technologies in the production, sales and supplying goods and services;
- rapid development of the companies involved in the development of computer hardware and software, extensive use of information and communication technologies, through which intensive reproduction is achieved;
- an evident change in the living standards among the population as well as the development of quality competition;
- impressive growth rates of the share of services in the structure of GDP.

Among the key problems of achieving success in the field of investing human capital, which would adequately develop and support digital economy in Ukraine, it is possible to highlight the following:

- low technological education, accessibility to the benefits and opportunities of the digital world not equal to all citizens, territorial digital inequality (rural population, low-income people, and elderly age groups are more restricted in the access to the Internet), an insignificant share of innovation in the digital economy (only 17% of Ukrainian industries use innovations, while in the EU this figure reaches 49%);
- obsolescence of equipment in the governmental organizations and structures (Ukrainian private IT companies can afford having the latest equipment, while the governmental agencies as well as small and medium-sized businesses are limited both in technologies and finance);
- low level of state support for modernization of fixed assets into digital ones, weak progress in approaching the key achievements identified in the harmonization of digital markets by the document "20 Anticipated Achievements of the Eastern Partnership by 2020", lack of an agreed strategic approach to establishing the policies of digital market harmonization with the EU [Zhekalo, 2019].

Investments in human capital can be made according to several directions: social (voluntary medical and pension insurance of employees, social benefits for certain categories of employees), health care (payment of medical care, preventive measures and medical examination, financing of physical education and sports), education (covering expenses for the participation of employees in seminars, conferences, and qualification upgrade courses), etc.

It is problematic to assess the effect of these investments as there is hardly any quantitative indicator for the mentioned categories. This raises the question of how effective it is to assess investment in human capital.

Unfortunately, the problem of assessing investment in human capital is the subject of discussion for both business entities and educational institutions, which provide training of the personnel to provide them with appropriate digital skills and competencies. Although the final indicators of business and education are completely polar, it is reasonable to consider the assessment of investing in human capital in terms of the effectiveness of these processes.

Herewith, based on the economic aspect of the efficiency indicator, it is recommendable to analyze efficiency as a consequence of comparing incomes / economic benefits as a result of investing in human capital with corresponding costs (based on the classical formulas pf efficiency).

The alternative and relatively simple methods of assessing the effectiveness of investment in human capital comprise the "methodology of O.G. Vaganyan" (equation 1):

(1) $$Z = \frac{X_e - X_b}{Y}$$

where *Z* - the investment efficiency ratio; X_e - the amount of human capital at the end of the reporting period; X_b - the amount of intellectual capital at the beginning of the reporting period; Y - the cost of investment in human/intellectual capital of the entity (enterprise, educational institution) - that is, investment in intangible assets [Kovelskyi & Rostova, 2020].

The amount of human capital is calculated as the difference between the capitalization of the entity and the replacement price of its real assets, with liabilities excluded. In particular, calculating the investments in intangible assets takes into account the costs of: research and development; education, qualification upgrade, employees' health promotion, social investment; information technologies, information coverage, technical support and software, formation and development of the brand; creation of a corporate portal, website; marketing; acquisition, dissemination, storage of information; development of distribution; development of corporate culture; acquisition of know-how, patents, other types of intellectual property.

Another alternative to assessing the investment in human capital of the organization is a fairly simple and clear "Alaverdian methodology" (equation 2) for commercial organizations [Alaverdian, 2017]:

(2) $$S = W * G + I * t$$

where S is an estimated value of the employee (the usefulness potential of such labor resource); W – salary of the employee; G – goodwill of human resources of the employee; I – cost of investment; t – the period of investment.

The application of the method of comparative analysis of the operating environment (Data Envelopment Analysis, DEA) is quite effective and informative for assessing the effectiveness of investing in human capital. The DEA method is based on the construction

of the so-called efficiency limit in the multidimensional space of input and output variables describing the objects whose efficiency needs to be determined. According to the DEA methodology, the objects being evaluated must operate in the same environment and, in the process of producing goods or services, transform the same set of input resources into the same set of output products. Whereas, this method is not parametric, instead of assuming a functional relationship between input resources and output products, a system of flexible weighted averages is used. The use of non-fixed weighted averages minimizes the risks of subjective evaluation by the research analyst.

The analyst obtains the optimal value of input and output indicators based on the results of the evaluation of the efficiency of investment in human capital using the DEA method. The management of the facility decides to increase or decrease the input or output indicators in order to achieve the level of efficiency, because there are other objects, real or hypothetical, that function optimally. Thus, DEA is not only a method of evaluation, but also a method of management, which is especially important in relation to the problem under study.

When applying the DEA method to assess the effectiveness of investment in human capital, a linear programming model is developed for each object, the effectiveness of which will be evaluated, and has the form:

(3) $$\min E$$

with restrictions for input indicators:

(4) $$\sum_i W_i \times X_i \leq X_0 \times E$$

with restrictions for output indicators:

(5) $$\sum_i W_i \times X_i \geq Y_0$$

with restrictions for weighted averages:

(6) $$\sum_i W_i = 1$$

where E – is the coefficient of efficiency of the object of study;

W_i – weighted averages;

X_i – indicators at the entrance of all objects under consideration;

X_o – indicators at the input of the object, which is assumed to be inefficient;

Y_i – output indicators of all considered objects;

Y_o – is the output of an object that is assumed to be inefficient. The condition $E, Wi \geq 0$ must also be satisfied.

To assess the effectiveness of investing in human capital of the enterprise according to the DEA method, the input indicators can be: total investment in human capital, the number of employees involved in the investment process. The output indicators include both financial and non-financial factors: the amount of net income, the amount of profit, reducing labor costs, increasing productivity, increasing the competence of employees, acquiring new professional skills and more.

Research in the area of results of investing in human capital confirms that currently there are no effective methods of assessing the return. Although there has been an insignificant improvement in certain years in favor of investment in human capital, less than 1% of investment aimed at increasing the value of human capital as a share of total operating expenses is a low value for the company. This can be explained, for instance, with a short period spent on the market and prudence of the company when making decisions on the investment projects. There is no doubt that in the current competitive environment of information technology and e-business, low level of investment in human capital can weaken future competitiveness of an enterprise.

Sociological research conducted in the EU member-states demonstrates that the scope of reward for the work completed by specialists who have mastered digital technologies is relatively high. In 2017, the rate of staff training as a percentage of income reached 14%, and compared to the year 2012, it increased by more than 12%.

Our study of the data provided by the Ukrainian public joint-stock companies in the Management Report for 2019 (information posted on the websites of corresponding companies, the reporting of 25 companies was studied) confirmed the interest of business entities in supporting the policy of investing in human capital. The non-financial indicators include: updating and modernization of information technologies, training and retraining of specialists involved in the maintenance of modern software products, material motivation to improve competencies and acquire high professional skills, generalized assessment of business investment policy (see Table 3).

Table 3. Results of a sociological study of non-financial information in the Reports on the management of domestic enterprises-issuers of securities

No.	Groups of nonfinancial information	Information Content	Share in non-financial indicators of the Report (%)
1	2	3	4
1	competitiveness of production	modernization of information technologies, growth rates in sales of a certain type of products or services; size and composition of the client base; market share and its increase; structure of software and product portfolio, etc.	6
2	activity level of technological processes	number of units of already sold finished products; hours worked; number of transported passengers; dynamics of activity in the course of the year, etc.	7
3	performance	production costs per unit; level of workload and automation of working capacities; average daily or hourly output, etc.	12
4	level of personnel professionalism	average level of rotation; number of hours of training, courses, or qualification upgrade received by employees; job satisfaction assessment; average working time of an employee in one position; the level of competitiveness of wages, etc.	14
5	social responsibility of a business	implementation of social programs, material motivation to increase competencies and professional skills	13
6	environmental safety	effectiveness and efficiency of measures taken to prevent and reduce the harmful effects of performance outputs on the environment, enhancement of the safety system in the workplace, etc.	8
7	level of corporate ethics	evaluation of communication effectiveness: professional support and respect, constructiveness and objectivity of management decisions, etc.	9
8	innovations	status and immediate prospects of production development; evaluation of the policy of technological equipment modernization, search for new innovative production technologies, expansion of the sales market	7
10	standing of the company	market position, brand value; share of consumers willing to accept a marketing offer; ratings according to independent experts, etc.	7
11	information on the enterprise development	state and immediate prospects of production development; assessment of business investment policy, search for new innovative production technologies	17
	Total		100

Source: own elaboration, based on public financial statements.

The following tasks have priority on the way to digitalization of business entities:

- improving the material factors of digital technology implementation: technical component (computers, network infrastructure programs) and uninterrupted Internet access;
- low digital competence and digital literacy of software and digital products users.

Strategic documents currently developed at the governmental level in Ukraine will define the vision with clear understanding of the transformation in information and computer technologies for the following 15-20 years, a resource plan for "digitalization" and research to evaluate the success of transformation processes.

Optimization of the processes of human capital investment as a powerful innovation and production resource of the present-day labor market implies providing state support to the following aspects:

- conducting independent qualitative and quantitative studies of the available digital skills in different population groups;
- development of the list of priorities in the required digital skills and competencies;
- review and update of the training programs for the staff;
- development and promotion of generally available online and offline digital literacy courses;
- introduction of the principle of mandatory digital competencies for employees;
- popularization of the importance of digital literacy among the population, etc.

Summary

As of today, it has become obvious not only at the hypothetical, but also practical level that every business entity, regardless of its organizational and economic structure, regional affiliation or chosen strategy, must undergo a digital transformation, which implies not only mandatory implementation of modern information and communication technologies, but also continuous organizational and cultural innovations.

The results of the conducted study confirm that application of "digital" technologies in practice is currently one of the most important and sustainable business trends. The digital trends in training and development of the staff imply provision of technical means, formation of the appropriate software and digital infrastructure, user training, etc.

Introduction and use of digital technologies in the enterprises will have many benefits, including: expansion of the employees' functions, which will allow processing of a large array of information, facilitation of searching for information, application of the latest advances in industrial development, quick responding to inquiries, tracking all news and trends online. Further research should be aimed at choosing and justifying alternatives to digitalization of domestic enterprises in view of the needs of national socio-economic development, as well as financial and resource provision by expanding the methods of training and development of human capital at the enterprise.

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