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ECONOMIC SCIENTIFIC QUALITY AS THE KNOWLEDGE ASSESSMENT OF HUMAN CAPITAL PRODUCTIVITY AT THE ENTERPRISE

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Introduction. The development of a knowledge-based economy is extending around the world. Knowledge becomes a weighty factor of innovative development. But the modern scientific community devotes special attention to the process of measuring the development of a knowledge-based economy at the state level. Such approach completely excludes the entrepreneurial level, and it does not allow to consider and analyze the complex elements of the knowledge economy that contribute to the development of enterprises. Taken into account that the GDP is formed just by business entities, and the knowledge carrier is human capital, it is necessary to study the influence of knowledge on the productivity of human capital.

A review of the latest sources of researches and publications. Nowadays, there are a rather large number of qualitative indicators that allow society to analyze and compare the conditions under which knowledge, the knowledge society and the knowledge economy in a whole develop. These are indicators proposed by various international organizations, including UNESCO, Institute for Statistics, Eurostat, World Bank Institute, OECD, International Telecommunication Union, etc. [1, c.48]

Since 2004, the World Bank has been implementing the long-term program "Knowledge for Development" (K4D) which is aimed to support of using of knowledge as a source of sustainable development.

According to the program, two summary indexes were developed – the Knowledge Economy Index (KEI) and the Knowledge Index (KI). The Knowledge Economy Index is a complex indicator, is characterizing the level of development of a knowledge-based economy in countries and regions of the world. The knowledge index is a comprehensive economic indicator for assessing a country's ability to create, accept and disseminate knowledge. This indicate is characterizes the potential of a particular country or region relative to the knowledge economy. It is calculated as the average of three indices: the education index, the innovation index and the information technology and communications index.

Also, no less important, the research and systematization of the indicators of science and engineering, Science & Engineering Indicators (SEI), carried out by the independent agency of the US government in the field of science and technology development of the National Science Foundation (NSF) [2].

As we see, among the proposed indicators, no one studies knowledge at the entrepreneurial level. All these indicators have a national nature and allow us to assess the potential of the state in a whole. But only the production enterprises with their unique scientific environment allow to create, develop and stimulate the knowledge economy on a national scale. Thus, the level of knowledge influence on the development of an individual business entity remains outside the scope of research. At the enterprise level, labor productivity can be used as an assessment of the use of knowledge.

The first studies of labor productivity are given in the works by such well-known scientists as G. Becker, J. M. Keynes, J. S. Mill, W. Petty, D. Riccardo, A. Smith, J. B. Sei, L. Thurow, I. Fisher, T. Schultz, J. Schumpeter and others. Modern studies of the economy of labor are presented in the works by D. Bossort, S. Brew, M. Gunderson, P. Doukins, S. Kuznets, K. McConnell, A. Ries, V. Rudel, D. Sapsford, R. Smith, T. Strombeck, Z. Tzanatos, D. Khamermesh, K. Filer, R. Elliott, R. Erenberg and others. The

question of assessing the productivity of intellectual work is given in the works by Ukrainian scientists: Hotelos U., Butnik-Severskyi A., Hieiets V., Humeniuk Yuю, Doronina A., Libanova O., Milevskyi S., Porokhnii V., Skripnichenko M., Fedulova L. and others.

Despite a large number of studies in this direction, the issues of assessing the knowledge potential and the productivity of human capital in the enterprise haven't still disclosed.

Formulation of the problem. The main tasks of the research are: to analyze the structural elements of the production enterprise and to identify the place of "origin" the development of knowledge; to study the process of formation and management of knowledge in the enterprise; to reveal the influence of knowledge on the efficiency of production; to consider the structural elements of the "economical science linkage" (ESL) indicator for assess its impact on the productivity of human capital.

Main material and results. Accentuation of attention and development of the research on the way of creating the indicator will allow to take into account and also qualitatively reflect the level of knowledge and scientific competence of the enterprise, and will help to represent the influence of knowledge on labor productivity. This approach discloses the enterprise as an economic system that allows to classify equipment and human resources and will show the relationship between intellectual capital and the economic science intensity of the enterprise.

The paper [3] considers labor productivity as an integrated factor in the development of knowledge-based economic systems. Any enterprise can be considered as an economic system, an important component of which is the structural and innovation system. The main task of this system is a constant orientation to the development not only of business as a whole, but also to stimulate the process of creating intellectual capital on the basis of human resources in order to ensure the preservation, concentration of all knowledge on the production of goods and services, management technologies.

Any enterprise is a complex organizational and production mechanism. Nowaday the solution of the problem of improving production is based on the system approach, it becomes necessary to develop the theoretical foundations of production systems, which in turn will help to clarify the essence of their technological, organizational, economic and social interrelations, to find effective methods for identifying the patterns of their functioning and development [4].

Production systems are artificially organized systems. The elements of systems are grouped so that each can function according to the principles and rules inherent only to a certain group of elements that are part of the corresponding structure of the system. The processes, which occur there, are connecting with transformation of objects of labor into a useful product. For the normal passage of such a process, it is necessary: firstly, to connect means and objects of labor, personal and material elements, and to find the optimal proportions of all components, in other words, to form an industrial structure; secondly, to manage them, that is, to create an organizational structure for managing the system; and, thirdly, constantly provide the production process (its personal and material elements) by conditions of successful functioning, that is, create the infrastructure of the production system [5, c.183].

Consider the general structure of a large manufacturing enterprise, where the most complete represent the structure elements of enterprise management functions (Figure 1).

With a reduction in the scale of the production enterprise, some units are aggregated, which reduces the number of elements, but all the previous functions remain and, in the integrated form, move to aggregated units.

As we see, the process of formation and development of knowledge begins with the services of the chief engineer, which includes the departments of design, technology, research, standardization and technical control, new technology, information systems and technologies. The important role in forming the potential of knowledge is played by the management unit for personnel and social issues. The Personnel Search and Training Department are responsible for collecting, educating and developing highly intelligent human capital.

Control block	Departments	Workshops
Director of operations	Industrial	Harvesting (machining) Assembly production Central workshop (if necessary)
Services of Chief Engineer	Designer	
	Technological	Instrumental
	Scientific research	Experimental
	Standardization and technical control	Measurement equipment and non-standard equipment
	New technology	Central Laboratory
	Information systems and technologies	
Economic cervices	Accounting	
	Planned and economic	
	Financial	
	Labor organizations and wages	
Commercial department	Logistics	Transport
	Marketing	Warehouses
	Co-operation	
Chief Power Engineer	Chief Power Engineer	Energetic
Chief Mechanical Engineer	Chief Mechanical Engineer	Repair
Department of Personnel and Social Affairs	Human Resources Department	
	Training of Personnel	

- Built by the author on the basis of research of structures of large industrial enterprises

Fig. 1. General structure of production enterprise

The result of intellectual work is intellectual capital. The enterprise can accumulate its own intellectual capital and / or attract external intellectual capital through any objects of intellectual property rights in the form of patents, technologies, as well as in high-tech equipment.

Thus, the following conditions arise for raising labor productivity in an enterprise by using intellectual capital:

– qualitative selection of personnel with knowledge of the technological process of production (conformity of education to activity);

– effective work to improve the skills of employees;

– conducting trainings in the sphere of work organization in a team;

– stimulating the formation of their own intellectual capital in the form of objects of intellectual property rights;

– acquisition and implementation of intellectual property rights;

– searching and introduction of new technologies, new equipment.

Consequently, the formation of the enterprise's knowledge potential is ensured by a combination of three components which are in constant interaction. There are the latest technologies, high qualification of employees and the ability to conduct the latest research and design work.

In order to measure and analyze the knowledge of the enterprise, in the process of the research, it was proposed to introduce a new economic category "economical science linkage". As noted in previous works, the very meaning of the category "science linkage" should determine the degree of technological progress in the enterprise; characterize the specificity of labor activity, due to technological features of production.

In turn, the "economical science linkage" is an indicator that can display in a good quality the scale of the influence of the science intensity of the enterprise on its production efficiency by increasing profits. That is, how effective were the measures to increase competitiveness through measures to establish new equipment, the introduction of new technologies and the development of skills of employees.

The concept of "economical science linkage" across the enterprise encompasses clearly defined groups of factors. They include: human resources, enterprise assets, intellectual work. Let's consider each factor separately.

It should be recognized that in the modern scientific environment there is no single-mindedness in the interpretation of the term "human resources". In retrospect, the scientific term "human resources" is associated with the loss of relevance of the categories "labor resources" and "personnel", and its spread is conditioned by the development of the theory of human capital [6, c.468].

Staff development requires to use of specific activities aimed at developing and enhancing its knowledge, capabilities and behavioral aspects, which should be taken into account when choosing a personnel strategy, a justify human resources policy, implemented in personnel development projects using modern methods and mechanisms related to competitiveness issues [7].

Competitiveness is formed as an integral indicator of the qualities at the expense of which a particular employee is the best in a particular position from the point of view of the organization, and at the expense of which the organization gives him an advantage. Therefore, the personnel are the "mover" of any enterprise. Without the human factor, the effective functioning of the organization is impossible. Without a qualified specialist, no firm is able to achieve its goal [8, c.222]

The increase in efficiency and productivity of personnel depends on the existing qualification of the employee (Figure 2). Thus, the administration is obliged to objectively evaluate and analyze the basic priorities of the employee in accordance with his qualifications and be guided by these tools to increase labor productivity.

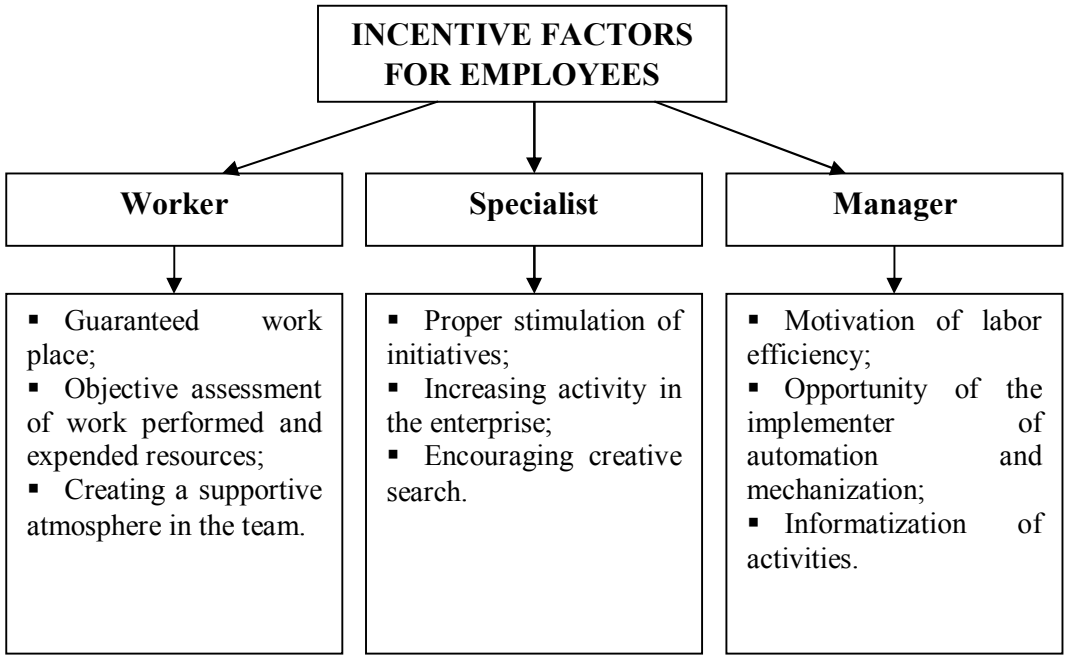


Fig. 2. Impact tools for the skill level [9, c.73]

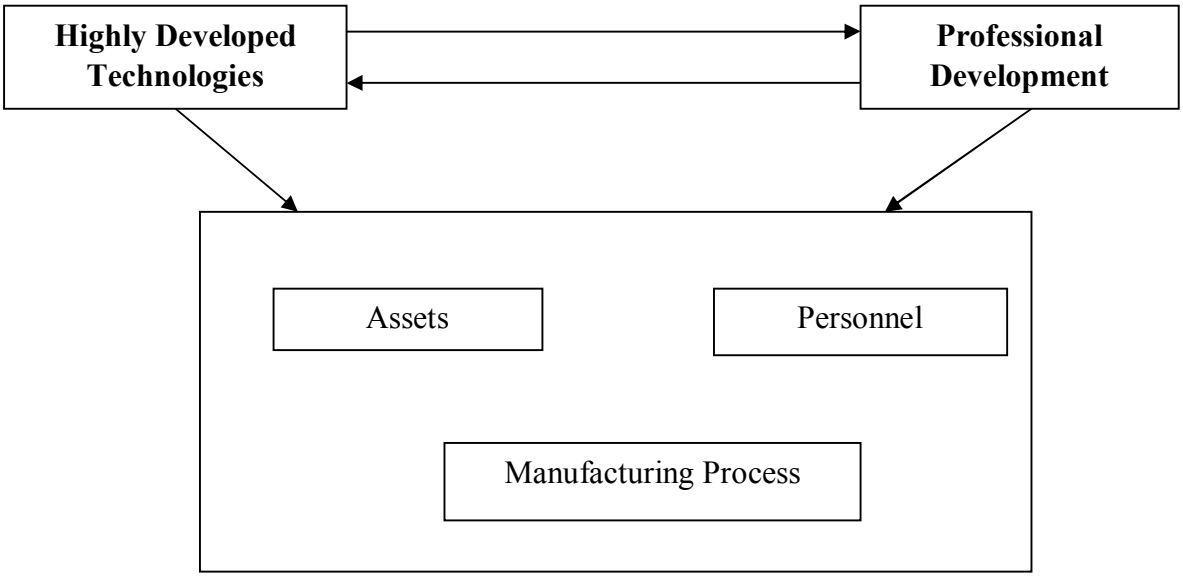
The main task of enterprise managers is to ensure its desired level of competitiveness by motivating staff for training, retraining and upgrading skills and self-development. The development of human resources

will ensure the identification of the personal potential of the employee and will enable the use the unique knowledge to improve the current state of the enterprise, through the implementation of scientific projects [10, c.180].

The next component is assets, which combines material and nonmaterial assets, their structure, means and opportunities to use with aim to generate income. Material assets are formalized in the form of fixed assets. In the scientific literature there is a large number of works devoted to the question of considering this concept. Analysis of these definitions of the concept of "fixed assets" allows us to state that the majority of authors, when disclosing the essence of this category, focus on such key criteria for recognition of fixed assets as: materiality of destination (material form; contained for the purpose of using them in the production process, delivery of goods, provision of services, leasing to others or for the implementation of administrative or socio-cultural functions); term of useful use (more than a year or an operational cycle, if it is more than a year) [11].

Thus, the definition of the "fixed assets" concept at the enterprise reflects the main factors of the formation of the "economic science intensity". It's about the equipment that exists in the enterprise.

In the conditions of constant market competition and the struggle for high technology production, there should be a kind of equipment turnover at the enterprises that ensures the updating of the technological capacity of the enterprise (Figure 3).



* Formed by the author

Fig. 3. Upgrading the technological capability of the enterprise

Thus, the rapid development of the high-tech sphere allows us to constantly develop and create new equipment, which, in turn, encourages entrepreneurs to buy and install it. Due to the appearance of the new technologies at the enterprise, the personnel must constantly develop, pass courses of the professional development, which is, spread their knowledge with the purpose of effective use of the acquired technologies. Thus, any enterprise is in a constant process of attracting knowledge, which is formed from the latest equipment. But to determine the economic science, it is necessary to classify all the equipment that exists in the enterprise.

In general, the equipment can be classified according to the three approaches:

- by the year of output;
- by the depreciation;
- in the presence of microprocessor control.

According to the year of output, the equipment can be outdated, modern and high-tech. But approach to the classification according to the depreciation can be found in the analysis of the company's balance sheet. Microprocessor technology, which can be built into the equipment, allows for software control of

technological processes. The presence of microprocessor technology makes it possible to integrate knowledge into equipment.

Intangible assets are accumulated own or borrowed intellectual capital, which is formalized in the form of various objects of intellectual property law.

The Research and Advanced Development allows to form your own intellectual capital. The introduction these results allows combining new equipment, the latest technologies to ensure the production of high-tech products, or significantly affect the economic performance of the production process. Such method provides an improvement in the quality of the product of production with a reduction in production costs.

All this provides an increase in the indicator of "economical science linkage" and contributes to:

– the increasing of production scales by expanding the ability to process large amounts of data;
– the increasing the amount of knowledge obtained and the possibility of their classification;
– the creation of new opportunities for further scientific and industrial development;
– reduce the participation of unskilled labor in the production process;
– the attracting of new investments;
– increase the competitiveness of the enterprise.

Conclusions. According to the results of the study was offer the indicator of "economical science linkage" can be used to assess the knowledge potential of any enterprise and the analysis of its components which can reveal ways to increase the potential of knowledge and its commercialization.

The indicator of the "economical science linkage" unites three groups of factors: human capital, its assets and forms, on the one hand, for forming new intellectual capital, and on the other hand, for the use of acquired intellectual and gaining competitive advantages.

Further research can be conducted to formalize the factors and determine the economic-mathematical model of the dependence of the indicator of "economical science linkage".

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Литвин Катерина Валентинівна, аспірантка. Запорізький національний технічний університет. **Економічна наукомісткість як оцінка знаннєвого потенціалу продуктивності людського капіталу на підприємстві.** Розвиток економіки, що заснована на знаннях, набуває поширення у всьому світі. Знання стають вагомим фактором інноваційного розвитку. Але сучасна наукова спільнота активну увагу приділяє процесу виміру розвитку знаннємісткої економіки на державному рівні.

На сьогодні існує доволі велика кількість якісних показників, що дозволяють суспільству аналізувати, порівнювати умови, за яких розвиваються знання, суспільство знань та економіка знань у цілому. Йдеться про показники, запропоновані різноманітними міжнародними організаціями, серед яких Інститут статистики ЮНЕСКО, Євростат, Інститут Світового банку, ОЕСР, Міжнародний союз електрозв'язку та ін.

Головними завданнями дослідження є: проаналізувати структурні елементи виробничого підприємства та виявити місце «зародження» та розвитку знань; дослідити процес формування та управління знаннями на підприємстві; виявити вплив знань на ефективність виробництва; розглянути структурні елементи показника «економічної наукомісткості» (ЕН) для оцінки його впливу на продуктивність людського капіталу.

За результатами дослідження запропоновано показник «економічної наукомісткості», який може використовуватись для оцінки знаннєвого потенціалу будь-якого підприємства, а аналіз його складових дозволить виявити шляхи підвищення знаннєвого потенціалу та його комерціалізації.

Показник «економічної наукомісткості» поєднує три групи факторів: людський капітал, активи та форми їх поєднання з одного боку для формування нового інтелектуального капіталу, а з іншого для використання набутого інтелектуального та отримання конкурентних переваг.

Подальші дослідження можуть проводитись для формалізації факторів і визначення економіко-математичної моделі залежності показника «економічної наукомісткості».

Ключові слова: економіка знань, продуктивність праці, людський капітал, інтелектуальна праця, нові технології, інтелектуальна власність.

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Lytvyn Kateryna, Zaporizhzhia National Technical University. **Economic Scientific Quality as The Knowledge Assessment of Human Capital Productivity at The Enterprise.** The issues of the influence of knowledge on the productivity of labor of the enterprise's human capital are considered. The necessity of applying the new indicator "economic science intensity" for determining the level of use of knowledge at the enterprise, the potential of knowledge of the enterprise and determining ways to increase labor productivity by raising the potential of knowledge is substantiated. A structural analysis of the organization of the enterprise is carried out. There are identified the departments that are most connected with the use and accumulation of knowledge. The rationale for choosing the factors that affect the indicator "economic science" is presented.

Keywords: knowledge economy, labor productivity, human capital, intellectual labor, new technologies, intellectual property.

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Литвин Катерина Валентиновна, аспирантка, Запорожский национальный технический университет. **Экономическая наукоемкость как оценка потенциала знаний в продуктивности человеческого капитала на предприятии.** Рассматрено вопросы влияния знаний на продуктивность труда человеческого капитала предприятия. Обоснована необходимость применения нового показателя «экономическая наукоемкость» для определения уровня использования знаний на предприятии, потенциала знаний предприятия и определения путей повышения продуктивности труда за счет повышения потенциала знаний. Определено подразделения, которые наиболее связаны с использованием и накоплением знаний. Представлено обоснование выбора факторов, которые влияют на показатель «экономическая наукоемкость».

Ключевые слова: экономика знаний, продуктивность труда, человеческий капитал, интелектуальный труд, новые технологии, интелектуальная собственность.