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TRANSITION TO A NEW PARADIGM OF HUMAN CAPITAL DEVELOPMENT IN THE DYNAMIC ENVIRONMENT OF THE KNOWLEDGE ECONOMY

Purpose. Establishing the qualitative characteristics of human capital and their compliance with modern trends of technical and technological development, formation of theoretical and methodological foundations of a new paradigm of human capital in a dynamic environment of the knowledge economy.

Methodology. The study is based on a set of general scientific and specific methods of scientific knowledge, namely: dialectical approach – to determine the main characteristics and factors of modern technical and technological development; methods of analysis and synthesis – when studying the essential characteristics of human capital and methodological approaches to its quantitative measurement; grouping and classification – when forming a sample of countries to study the impact of public welfare on human capital indicators; mathematical statistics – to establish the relationship between per capita GVA and HDI.

Findings. On the basis of the analysis of theoretical and methodological approaches proposed by leading international organizations to understand the essence of human capital, the lack of unity in the interpretation of this category with virtually unified methods of its quantitative measurement is stated. The main features of the current stage of technical and technological development, which is identified as a knowledge economy, are highlighted, and the inconsistency of key components in the existing indicators of human capital assessment with the realities of knowledge-intensive economic growth is shown. A regression model is built, based on which the dependence of human development indicators and, accordingly, human capital on the achieved level of social welfare in a given country is shown. The reasons of this dependence are identified and the principles of a new paradigm of human capital in the dynamic environment of the knowledge economy are proposed.

Originality. The limitations of the dominant theoretical and methodological approaches to the quantitative assessment of human capital in the knowledge economy have been established. The transition to a new paradigm of its formation in modern conditions is grounded. It is proved that the qualitative parameters of human capital depend on the level of social welfare achieved in a particular country, which means that the processes of investing in human capital and increasing economic growth rates in individual countries are not always linear. The latter has been identified as one of the factors of intensification of global imbalances in technical and technological development.

Practical value. Understanding the dependence of socio-economic development on the technical and technological component and its compliance with the basic characteristics of human capital allows governments to develop more effective economic policies aimed at forming an effective knowledge-based economy.

Keywords: *technical and technological development, knowledge economy, human capital, innovation, global inequality*

Introduction. The current stage of human civilization progress is notable for cardinal changes in all spheres of the society functioning. Transition to a new period of engineering and technological progress, i. e. formation of the knowledge economy, is the most important one. By contrast with the previous epochs, the latter brings scientific knowledge and information to the forefront transforming them into the real-life production resources and key development drivers. Under the conditions, traditional productive factors become irrelevant; a human, being a direct creator of new knowledge and the main information carrier, becomes the crucial factor of social wealth creation. Hence, human capital is so essential for the knowledge economy: only the economic system, possessing sufficient quantity and quality of human resources able to generate new ideas, produce innovations, and implement fresh technologies; it can support both high and stable rates of science-intensive type of economic growth. Awareness of the dependence has made governments of many countries emphasize the increase in the amount of human capital and create favourable conditions to reproduce it. In turn, the abovementioned heightened competition for human resources. Under the pressure of competitive forces, shareholders aspire to maximize equity value of their company in the shortest time possible keeping on only highly qualified experts. The abovementioned becomes the weighty factor of a demand-supply gap in the labour market, increases the requirements for intellectual qualities of young specialists and employees, and intensifies migration processes. Consequently, business globalization and stiff competition for engineering and technological leadership sharpen discrepancies in the levels of life quality and accessibility to innovative resources between the developed economies and developing ones, thus being the factor of rise in inequality.

Literature review. The global development disparity of engineering and technological progress has become a research object of many outstanding scientists. Relying upon R. Solow's ideas on the inevitable convergence of the countries, having access to the same technologies (Solow, 1956), they tried to introduce new factors into economic growth models, and demonstrate their effect on the public welfare growth. In the 1960s–1990s, the most popular approaches were those where engineering and technological advance, which depended directly upon the human capital parameters, was the priority factor of economic growth. Starting from pioneering works by R. Lucas (1988) and P. Romer (1992), who actually transformed technological progress from an exogenic factor into an endogenic one and first connected it with human capital qual-

ity, and ending with studies by G. Mankiw, D. Romer, and D. Weil (1990), who proved definitely that investment in human capital could push through the disparity in economic growth rates among different world countries (G. Mankiw, D. Romer, & D. Weil 1992). During the time period, scholars mainly focused on the educational component of human capital. The matter is that R. Lucas, applying extensive empiric data, proved that growth rates of human capital itself is directly proportional to the educational time investment. Relying upon the idea, G. Mankiw, D. Romer, & D. Weil developed their model while measuring human capital as the share of population, who attended secondary school (i. e. aged 12–17 years) multiplied by a share of employable school-age population (i. e. aged 15–19 years). In the context of such an approach, the scholars miss basic education as well as higher one. However, the abovementioned could not prevent them from supporting once again the dependence of economic growth rates upon human capital.

Further, Aghion & Howitt (1992) paid attention to the importance of innovative factor for economic growth and formalized the known Schumpeterian idea on creative destruction for their model. That needed certain changes in the traditional concept of influence of an educational component of human capital. It has become clear enough that only highly skilled workforce can generate innovations. Ch. Jones has proved convincingly that the connection between public welfare and human capital, described by the available models of economic growth, took place only before the first half of the *20th* century. After scientific and technological revolution of the 1950s, new technologies started identifying production profitability; hence, investment in Research & Development has become an item of priority. Thus, the increase in the number of scientists, researchers, and scholars started to be considered as the key factor of enhancing of the critical amount of human capital.

While developing the tendency, scholars improved constantly the available approaches. Mainly, it was a feedback to numerous empirical validations of the formulated models of economic growth in the light of human capital. In such a way, popular models by R. Barro & X. Sala-i-Martin; W. Baumol; B. DeLong; P. Krugman; P. Klenow & A. Rodriguez-Clare and other scholars have appeared which tried to explain in one way or another the GDP-human capital interconnection, being hardly obvious in practice, and show conditions and characteristics of the latter able to generate long-term economic growth. The problems remain topical since the new data, obtained in the field of technological advance, support the idea of nonlinear nature of human capital investment as well as increase in the economic growth rates of certain countries. While analysing the current connections between human capital coefficients, R. Barrohas recognized that only about a half of the coefficient estimates is positive and statistically significant [1]. Having analysed a huge number of scientific papers, concerning human capital problem, J. Botev, B. Égert, Z. Smidova, and D. Turner brought to light the paradox, the widely accepted importance of human capital, but the difficulty of finding and empirically relevant measure of it – which our recent work addresses [2]. Recent OECD studies confirm the difficulty of finding a robust positive effect of human capital on income per capita or productivity levels when looking at the OECD countries [3, 4]. At the same time, G. Psacharopoulos & H. Patrinos have applied a new index of human capital introduced by the OECD. They applied sampling of five countries during three periods for various mathematical efficiency regressions and obtained a number of important positive interconnections [5]. Hence, economic science faces a problem to search such a model of human capital formation which would help approach temporally and spatially human capital investment areas and benefit from its functioning as a productive resource.

Purpose. The necessity to solve the problem has identify the study purpose being determination of qualitative characteristics of human capital as well as their correspondence to the current tendencies of technological advance, and formation of theoretical and methodological foundations of a new paradigm of human capital within dynamic environment of the knowledge economy.

Results. Socioeconomic progress of the development of a society relies upon an engineering and technological component determining economic potential to produce goods and services and generate public welfare. However, in this context, engineering and technology is one of the elements of productive forces, in whose structure people take the lead. Owing to a human factor, more advanced means of production, able to improve the production efficiency drastically, are developed and put into operation. Hence, a human plays a double role in the field of social production being a source of its progress as well as a beneficiary of its results. Thus, it is quite natural that economic science has always connected labour productivity growth with personnel skill level; and from the second half of the *20th* century – with quantitative and qualitative characteristics of human capital.

T. Schulz (1960), who implemented the category to be applied scientifically, has mentioned that his concept relies upon something existing actually and possessing economic characteristic to render future services having a defined cost. Therefore, human capital started to be interpreted as a form of capital, combining knowledge, skills, and psychological features of a human as a source to increase his/her benefits as well as public welfare as a measure of the capability, embodied in a human, to produce a profit. In 1962, G. Becker, who is considered to be a creator of the scientific paradigm of human capital, focused on a formation process of the latter as a store of knowledge, skills, and motivations resulting from the investment in education, health care, accumulation of professional background, search for information, work-related mobility and so on.

Such new theoretical approaches to analyse workforce initiated since the 1960s bolstered significantly a role of complicated labour in production focused increasingly on the achievements of scientific and technological revolution of the 1950s. Production processes required specific personnel skills which would help put into operation more complicated equipment and implement new techniques. That is why intellect, living knowledge, skills, abilities, and professionalism within a narrow sphere of economic activity were among the mandatory parameters to form the workforce. G. Becker was one of the pioneers who started evaluating qualitatively the components of human capital singling out the three basic forms: general knowledge (general human capital); specific knowledge (specific human capital); and other knowledge (additional human capital). The scholar believed that the first form of the capital resulted from parenting as well as from high school education and university education. The second form is developed in the process of direct labour activities at a certain workplace. Finally, the third one depends upon a human ability to handle information helping enhance a knowledge level and find more forward-looking field of economic activity (Becker, 1995).

Over time, scholars applied the first efforts to evaluate quantitatively human capital while developing economic growth models (for more details see [6]). The necessity for data, representing quantitative characteristics of human capital, encouraged numerous international organisations to measure it constantly. Currently, the approaches, implemented by the World Bank, International Bank for Reconstruction and Development, Organisation for Economic Co-operation and Development, the World Economic Forum, and the United Nations are the most popular ones (Table).

As Table explains, conceptual approaches of different organizations interprets 'human capital' category somewhat variously. Version one of studies by the Organisation for Economic Co-operation and Development, put an emphasis on knowledge and skills while further the category was expanded

Table

Interpretation of human capital by international organisations

Organisation	Content of the category
Organisation for Economic Co-operation and Development (OECD, 1998)	Knowledge, skills, competencies and attributes embodied in individuals, and can be considered as relevant for economic activities
Organisation for Economic Co-operation and Development (OECD, 2001)	Knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being
Organisation for Economic Co-operation and Development (OECD, 2011)	Skills and competencies, mainly acquired through education and experience, which also can represent inborn abilities, certain motivational and behavioural aspects as well as such attributes as physical, emotional, and mental health
United Nations (UN, 2016)	Knowledge, skills, competencies and attributes what was based on parenting, education, on-the-job training, informal learning, health care, migration
World Economic Forum, 2017	Human capital represents a level of formal education of younger and senior citizens as a result of past educational investment; formal education of next generation workforce; further training and retraining of the current workforce; application and accumulation of skills among the adult population; and width and depth of use of the specialized skills in the work
World Bank (International Bank for Reconstruction and Development and the World Bank, 2018)	Human capital consists of the knowledge, skills, and health that people accumulate over their lives, enabling them to realize their potential as productive members of society. It has large payoffs for individuals, societies, and countries

up to competencies inclusive of inborn abilities and certain behavioural aspects. Version of 2011 by the Organization added indices of physical, emotional, and mental health to the human capital components. In counterpart to education and health, the United Nations Economic and Social Council is complemented interpretation of the human capital by professional characteristics of workforce as well as the acquired experience. It should be mentioned that the UN considers certain components characterizing human capital from the viewpoint of such a wider idea as 'human progress'. The latter combines indices of education and health with a living standard index; it can also characterize human capital. Finally, an approach by the World Bank, which represented its methods to calculate Human Capital Index in cooperation with the International Bank for Reconstruction and Development at the Annual Meetings of the International Monetary Fund and The World Bank in 2018, is focused on the three basic components: knowledge, skills, and health.

Relying upon not always identical understanding of a 'human capital' idea, the world organizations propose some different procedures to measure it. In such a way, evolution of analysis of human capital nature by the OECD formed gradually a notion of its multidimensionality. Unfortunately, for some reasons beyond control, the factor could not be evaluated quantitatively in full. Different types of human knowledge, skills, and abilities are predominantly unseeable forms of the capital. Hence, only levels of the acquired cognitive skills and explicit knowledge can be measured with some degree of certainty. All other aspects of human capital, i.e. skills of noncognitive nature acquired beyond formal education as well as the acquired experience, can be involved only owing to the application of such indirect methods as testing, inquiry, expert evaluations and others. However, the abovementioned prevents from unification of the data collection process and permanent acquisition of the information on a country-by-country basis. That is why emphasizing importance of all other components of human capital, the OECD concentrates mainly on its calculations through the education level being the simplest and easily measured index. 'A new OECD measure of human capital builds on two components: years of schooling and rates of return to schooling. Its novelty comes from its assumptions on marginal rates of return to education. Previous studies used the same rates of return for all countries and these did not change in time' confirms *The Value of People* report (OECD, 2011).

While understanding the complexity of the multidimensional approach to obtain the unified human capital index, the United Nations Economic Commission for Europe has developed a guide to measure it. The guide relies upon the available procedures and singles out three dominating calculation methods, namely: cost-based; based on determination of income, earned by an individual throughout life; based on certain indicators. Procedure one grounds on Shultz (1961), Kendrick (1976), and & Eisner (1985) studies. It involves calculation of human capital as the discounted value of past investment flows by the economic entity personally, by his/her family, by employers, and by the state. In terms of procedure two, comprised of contributions by Weisbrod (1961), Graham & Webb (1979), Jorgenson & Fraumeni (1989, 1992a, 1992b), and Inclusive Wealth Report (2012, 2014), human capital is measured as the total of the discounted cost of all future income flows expected to be earned by the population throughout life. If procedure one is focused on the investment expenditures (i.e. contribution to capital provision), procedure two concentrates on its returns, i.e. monetary evaluation of financial benefits, which a human capital owner may obtain over the course of life. The two procedures are considered as analogous to cost side and revenue-raising side of the System of National Accounts (Abraham, 2010). Finally, procedure three, represented by the OECD (2001, 2011) and Barro-Lee (2010, 2013), evaluates human capital on the basis of such three educational indicators as adult literacy rate, education coverage, and its average duration [7].

Materials of the World Economic Forum note that it is impossible to determine human capital only by means of formal education and qualification of employees since there are numerous factors increasing or decreasing it. Hence, dynamic measurement of the category, represented in the methods calculating the Global Index of Human Capital (World Economic Forum, 2017) is quite important. The latter consists of three components: efficiency (i.e. level of formal education of the younger and the older generations as a result of past educational investment); progress (i.e. formal education of next generation workforce, and further training and retraining of the current workforce), allocation (i.e. use of the skills and their accumulation among adult population); and know-how (width and depth of use of the specialized skills in the work) [8].

In contrast to the above Global Index of Human Capital, the Human Capital Index (HCI) of the World Bank rests on the measurement of human capital that will be available to a child who is born now and reaches the age of 18 in terms of certain health and educational characteristics of a certain country. The index represents expectable efficiency of the child as a future worker relative to the standard being similar

for each country in view of fullness of educational and health indices (World Bank, 2018). The HCI comprises the following components: survival, the expected schooling years, and health. Component one mirrors the fact that children, born now, should survive until the process of human capital accumulation starts with the help of formal education. The survival is measured by means of under-five mortality rate. Component two contains information on the number of education years the child may reckon for until 18. Moreover, the information combines with quality index, i. e. how many children get schooling. The index is based upon relative success of countries engaged in the international testing as for the mastering mathematics and natural sciences. Thus, taking into consideration quality of education, the component visualizes such reality that in some countries children are taught far fewer than in others despite the fact that they attend school during similar time period. Finally, a health component applies two indices for the total health level of a country: growth inhibition rate in under-five children and adult survival rate determined as a share of fifteen-year-olds who will survive up to 60. Index one represents the health observed during prenatal, child, and early development of children; index two explains a range of health consequences the child, born now, can survive as an adult [9].

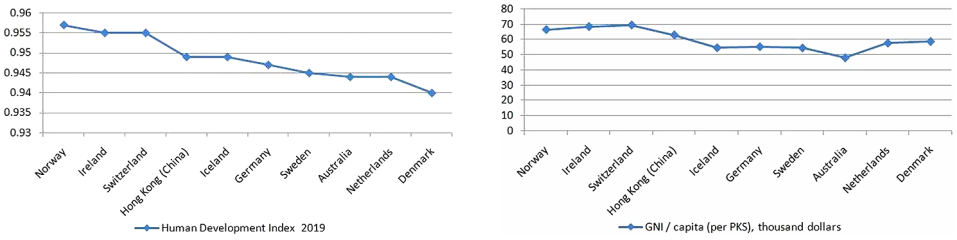
Analysis of the considered approaches (irrespective of their difference in view of the measurement components) shows that all of them give the highest priority to the educational component. The fact is meant by the recent report of the World Bank pointing out that certain discrepancies between the quantitative and qualitative education indices form the majority of differences in the human development index among 174 countries under study. Thus, comparison of the average country from high- and low-income groups has demonstrated that 33 % of differences in their growth depend upon human capital where 25 % are explained by educational parameters [10]. Consequently, according to studies by the world organisations, from the viewpoint of human capital, success of the current development stage is determined mainly by means of quantitative and qualitative educational indices.

Nevertheless, more profound studies show that the connection is not always a linear one. Metaanalysis of 60 research works on dependence between education and macroeconomic results of the country development, published from 1989 to 2011, demonstrated that almost 20 % of the estimates of human capital ratios were negative. The recent studies by the OECP also emphasize complexity in the determination of the stable positive human capital influence on the per capita income or on the efficiency level (Botev, et al., 2019; Guillemette, et al., 2017; Fournier and Johanson 2016) [2, 3, 5]. The scholars try to explain the paradox connecting it in the majority of cases with imperfectness of the approaches to quantitative measurement of human capital.

Having such ambiguous results in the field of analysis of human capital as such, we have concentrated our attention on the human development index (HDI) measuring the key components of human capital (i.e. life expectancy at birth, expected years, and middle years of schooling) but connecting them with public welfare [11]. According to 2019 rating as for the data on the development of the world economies, Norway takes the lead in terms of GNI per capita being $66.694 thous. and Denmark ranks No.15 in the world where similar index is $58.662 thousand. The data were applied to develop a regression model of $Y = 0.9115 + 0.0006X$ type. In terms of the model, in 2019, top ten of the countries, shown in Fig. 1, demonstrate that 100 % increase in GNI per capita results in 0.06 on average.

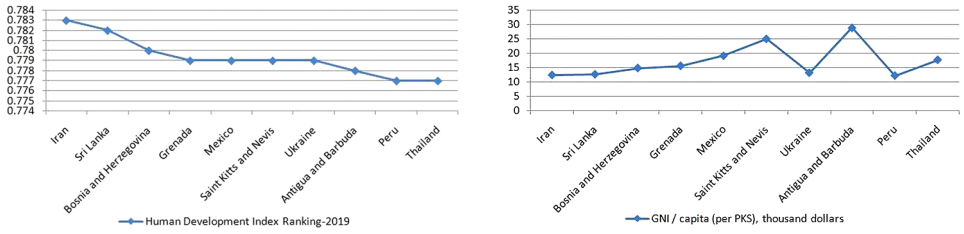
However, the data concerning developing countries (we consider countries ranking Nos. 70–79 in the world, whose human capital indices as for the education and health are not the lowest ones) demonstrate nonavailability of HDI-economic growth connection. Correlation coefficient between the variables for countries, shown in Fig. 2, turned out to be negative ($r = -0.377$).

Ukraine ranks No.74 in the abovementioned rating neighbouring the 'third world' countries. As it follows from Fig. 2, *a*, in terms of similar HDI value, being 0.079, Ukraine demonstrates the lowest GNI index per capita, i. e. $13.216 thousand. Hence, the model demonstrated rather high index of positive correlation between HDI as a resulting variable (Y) and GNI (in terms of PPP) per capita as a factor variable (X). The abovementioned supports the idea that high indices of human development and, hence, human capital have the developed economies. According to the model, correlation coefficient turned out to be 0.768 only for ten top countries of the rating. Hence, increase in the GNI index (namely, its GDP components within the country as well as net profit got abroad) is the



a *b*

Fig. 1. Top ten of the countries in the world Human Development Index rating in 2019 [11]:
a – HDI-2019: 1–10 ranks; b – GNI per capita, USD thousand: 1–10 ranks



a *b*

Fig. 2. Developing countries in the world Human Development Index, 2019 [11]:
a – HDI-2019: 70–79 ranks; b – GNI per capita, USD thousand: 70–79 ranks

source of resource provision of the human capital development. In addition, it is the factor intensifying uneven socioeconomic development of the world.

First of all, the tendency can be explained as follows. The current economy has changed drastically its basic development drivers; it is moving rapidly to a knowledge-based model where innovations become motive power and knowledge, education, and science are the sources. Respectively, a creative worker, able to generate new ideas, design new facilities, and implement new technologies, is the key component of such an economy. The conditions involve not only increase in the share of intellectual labour while creating value added; factors of the creativity growth become powerful. It is common knowledge that creativity can be fully implemented if only environment is friendly, i.e. favourable conditions have been created to unlock maximally the talents and creative potencies. Consequently, today we are witnessing the global tendency of transition of representatives of creative human capital to the countries having high welfare indices; basing on it, we can provide the advanced profitability of the key resource. It is known that the yield rate of new knowledge depends upon the available for certain economy mental vocabulary as well as incentives to invest in the storage. It is understood that higher return on human capital in a certain country inspires ambitions to unlock proper potential right there where it is possible to earn higher profits.

Along with it, concentration of scientists and engineers where adequate infrastructure and creative environment are available, becomes the extra factor intensifying the effect of innovation deployment. Policies of the advanced countries, encouraging mobility of researchers and gifted students, favour creation of clusters of science, technologies, and human capital as the means to augment proper research potential and support innovative environment. Currently, the USA embraces 49.1 % of all foreign doctoral students trained in the field of natural and engineering sciences. The UK embraces 9.2 %; and France embraces 7.4 % [12]. The USA, the UK, France, and Germany lead among the countries inviting foreign Doctors of Sciences and researchers to participate in scientific and educational projects. While creating more favourable conditions for research practice, publications, and activities in laboratories, equipped with unique facilities, the countries improve in such a way qualitative characteristics of human capital of a certain community within their terrains and promote higher innovation [Ibidem]. Hence, each year we observe a growing tendency of migration in search for higher labour remuneration. In turn, the abovementioned gives rise to disparities in the centres of education costs and centres of income generation, i.e. obtaining higher added value from migrants being human capital carriers. 'Brain hunting' changes space of creative environment as well as directions of competitive forces and investment attractiveness of countries with high concentration of talents in such critical sectors as biofuel engineering, pharmacy, agrotechnology, and ICT.

The considered approaches determining human capital cannot take into account the factors in full. Hence, to understand more entirely the factors of socioeconomic development it is required to study constantly new tendencies arising in the field. Fig. 3 demonstrates the current features of the knowledge economy as a social advancement stage challenging transition to a new paradigm of human capital progress.

The social phenomena as well as socioeconomic processes, represented in Fig. 3, actualize problem of human capital development in the context of dynamic environment of the knowledge economy identification of values in the complicated world when:

- consciousness varies under the effect of computer information technology;

- market value of the global intellectual IT sector companies exceeds manifold capital cost owing to efficient management and investment. Such companies as Microsoft, Apple, Amazon, Alphabet, Google, and Facebook exemplify the fact;

- future sources of human capital development become unpredictable as well as communication forms between the explicit knowledge and implicit one;

- human capital development depends directly or indirectly upon thinking by means of sophisticated categories representing synergy processes during interaction of HC components, and ability to operate by value-based ideas of inclusive economy, and mirror the multidimensional space of human capital development covering not only economic factors but also social, political, environmental, and spiritual ones;

- interest is heightened to a dynamic aspect of system analysis of human capital having a potential for immanent changes and development. Hence, it is quite important for a process of human capital study to identify reasons and mechanisms of its transformation for achieving goals of sustainable development;

- threats are emerging as for the human knowledge undervaluation within the dynamic environment of nonlinear economy intensifying processes of labour migration of talents and unbalancing both managing and administered socioeconomic systems as well as their efficiency.

In view of the new tendencies, more adequate evaluation of human capital should involve expansion of components of the indicators used to measure the factor of socioeconomic development. We believe that micro- and macroeconomic indices, measuring internal structure of human capital, have to be such extra components. They help evaluate correspondence to the requirements of the knowledge economy and possibility to develop, implement massively, and master the technologies adding value in the traditional sectors of economy as well as forming structural economic improvements in the context of priorities of the Fourth Industrial Revolution. It should be mentioned that since individual human capital is implemented in relevant knowledge and skills, then their level and dynamics should be covered by the extra indices. Thus, for instance, not only the number of education years must identify parameters of individual human capital but also quality indicators of such education. Among other things, it concerns information technology, involved in the educational process and correspondence of specialism area of the individual to the current technological requirements. At a level of human capital of an organization and country, indices of share of specialties of innovative technological wave, population access to the Internet, share of researchers in the population structure, patents and so on should become the efficiency factors of expenditures connected with human capital.

Methodologically, such indicators can be adopted from other global ratings of the countries characterizing the knowledge economy. Among other things, it concerns indices of innovation, the world competitiveness, technological availability and others. We consider it important to consider the structure of human capital accumulation in a country while calculating a share of negative, passive, and positive human capital to evaluate its creativity and efficiency. Totally, the additions will make it possible to evaluate better innovative tendencies of human capital development as well as its potential and real effect on the current economic growth.

Conclusions. The new stage of technical and technological development, determined as creation of the knowledge economy, is characterized by cardinal changes in the basic factors of economic progress of a society. Currently, scientific knowledge and information become the driving production resources, which need formation of human capital of special quality. Nowadays, industries need creative workers able to generate new ideas, produce innovation, and implement new technologies. Demand for such human capital makes countries compete for talents, which deepens global unevenness of technical and technological development.

First, economists paid attention to human capital as a factor producing economic welfare of countries in the 1960s – 1990s, when the first models of economic growth were developed and technical progress was taken into consideration. In

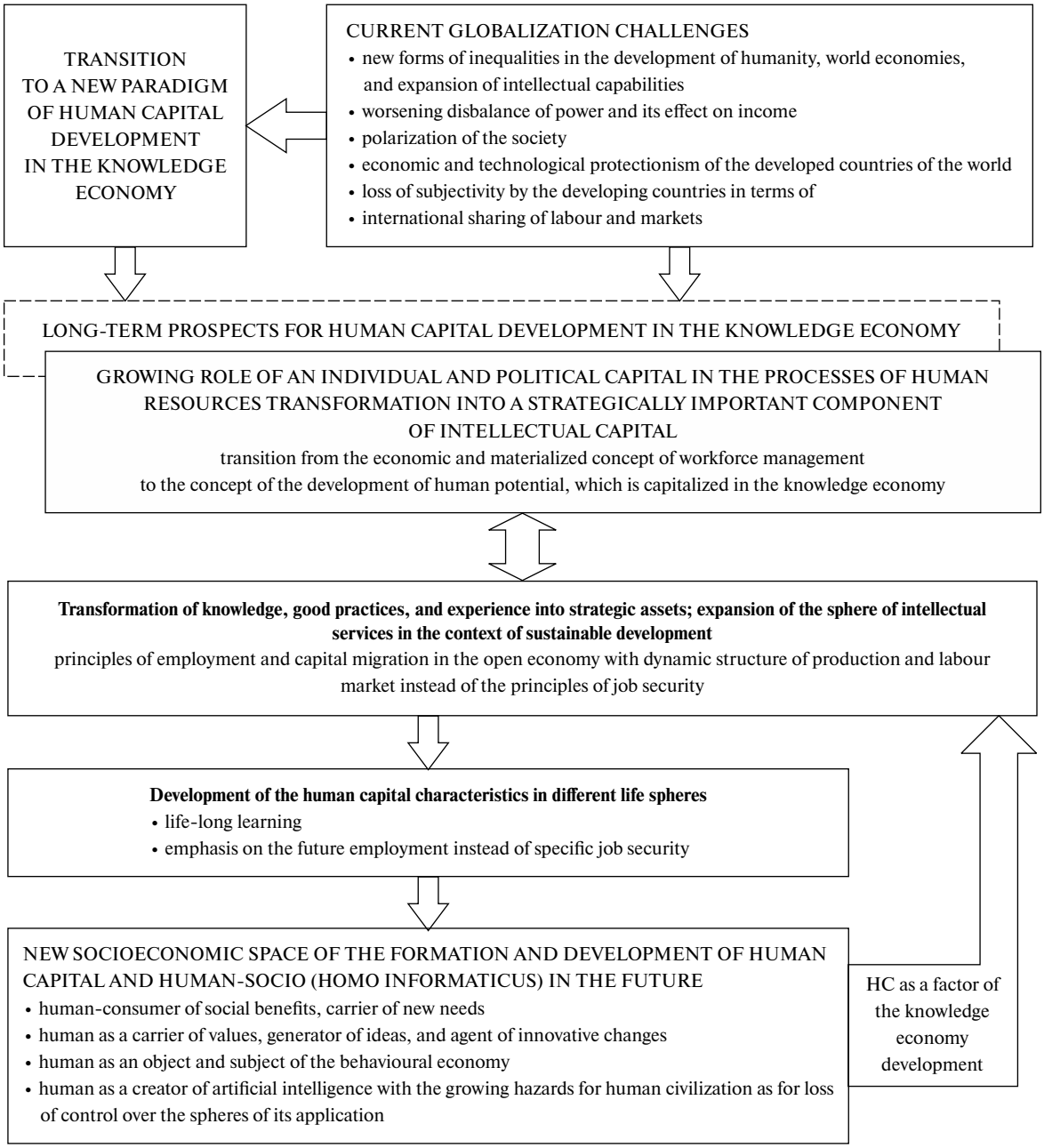


Fig. 3. Transition to a new paradigm of human capital development within the dynamic environment of the knowledge economy

the course of economic development (especially, when achievements of scientific and technical revolution of the 1950s started to be introduced into production), the models began to demonstrate their limitedness as for the explanation of new phenomena and processes of science-intensive economic growth. Generation two of models, developed by R. Barro & X. Sala-i-Martin, W. Baumol, B. DeLong, P. Krugman, P. Klenow & A. Rodriguez-Clare, was intended to search for new factors of economic development, and explain nonlinear nature of GDP-human capital connection in certain countries.

Empiric assessment of new models of economic growth is based upon the use of qualitative evaluations of public welfare and human capital. Currently, the latter is measured relying upon the theoretical and methodological approaches developed by the key international organisations. First, analysis of the approaches demonstrates ambiguous interpretation of human capital idea by different institutions; second, similarity of methods for its quantitative measurement is shown where particular attention is paid to the educational component.

The knowledge economy, being science-intensive, computerized, and innovative, brings to the fore fundamentally new requirements for workforce, which cannot be evaluated fully with the help of indicators used by the major international organisation as a basis for the development of human capital indices. Hence, it is required to move towards the current new paradigm of its formation; theoretical and methodological approaches for its evaluation should involve qualitative component of human capital, efficiency of investment in its formation and development, and real as well as potential ability to obtain and apply new technologies.

The developed regression model helped demonstrate dependence of human development indices and, hence, human capital upon the achieved level of public welfare in a certain country. The abovementioned is explained by the effect of increasing productivity of intellect use within the environment of larger knowledge concentration. The latter is intensified in the process of talent migration as well as implementation of policies of the key world countries as for the attraction of gifted youth and scientists. The abovementioned is among the factors deepening global disparities of technical and technological progress since the better-quality capital is concentrated in the advanced economies.

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Перехід до нової парадигми розвитку людського капіталу в динамічному середовищі економіки знань

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Мета. Встановлення якісних характеристик людського капіталу та їхньої відповідності сучасним тенденціям техніко-технологічного розвитку, формування теоретико-методологічних засад нової парадигми людського капіталу в динамічному середовищі економіки знань.

Методика. Дослідження базується на сукупності загальнонаукових і специфічних методів наукового пізнання, а саме: діалектичному підході – для визначення основних характеристик і факторів сучасного техніко-технологічного розвитку; методах аналізу й синтезу – при дослідженні сутнісних характеристик людського капіталу й методологічних підходів до його кількісного виміру; групування та класифікацій – при формуванні вибірки країн для дослідження впливу суспільного добробуту на показники людського капіталу; математичної статистики – для встановлення взаємозв'язку між показниками ВВД на душу населення та індексом людського розвитку.

Результати. На основі аналізу теоретико-методологічних підходів, запропонованих провідними міжнародними організаціями до розуміння сутності людського капіталу, встановлено відсутність єдності у тлумаченні даної категорії при практично уніфікованих методиках його кількісного виміру. Виокремлені основні риси сучасного етапу техніко-технологічного розвитку, що ідентифікується як економіка знань, та показана невідповідність ключових складових у наявних індикаторах оцінки людського капіталу реаліям наукомісткого економічного зростання. Побудована регресійна модель, на основі якої показана залежність показників людського розвитку і, відповідно, людського капіталу від досягнутого рівня суспільного добробуту в певній країні. Виявлені причини такої залежності й запропоновані засади нової парадигми людського капіталу в динамічному середовищі економіки знань.

Наукова новизна. Встановлена обмеженість домінуючих теоретико-методологічних підходів щодо кількісної оцінки людського капіталу в економіці знань. Аргументовано перехід до нової парадигми його формування в сучасних умовах. Доведено, що якісні параметри людського капіталу знаходяться в залежності від досягнутого у певній країні рівня суспільного добробуту, а значить, процеси інвестування в людський капітал і нарощування темпів економічного зростання окремими країнами світу не завжди є лінійними. Останнє ідентифіковано як один із факторів посилення глобальних дисбалансів техніко-технологічного розвитку.

Практична значимість. Розуміння залежності соціально-економічного розвитку від техніко-технологічної складової та відповідності її основним характеристикам людського капіталу дозволяє урядам країн розробляти більш ефективні варіанти економічної політики, спрямованої на формування ефективної економіки, заснованої на знаннях.

Ключові слова: *техніко-технологічний розвиток, економіка знань, людський капітал, інноваційність, глобальна нерівномірність*

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