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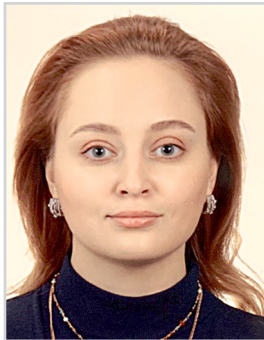
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Intellectualization of economy and quality of human capital in the context of lifelong learning system development in the world

Abstract. In the presented research, a comprehensive analysis is undertaken in relation to such complex phenomena of the modern knowledge society as «intellectualization of economy», «human capital» and «lifelong learning» in their inextricable interrelation and within a single research discourse. Novel connotations, which have emerged within the content of these categories with the transition to the sixth techno-economic paradigm, were respectively substantiated. The definitions of intellectualization of economy have been provided with the account for specific characteristics of highly skilled labor that are formed by the system of lifelong learning. The latter, in its turn, performs social as well as economic and production functions which attest to an ambivalent nature of education as a public and simultaneously an economic good.

It is proven that in all diversity of existing indices and studies on the intellectualization of economy conducted according to various indicators the assessment of the national system of lifelong learning is up until presently not used within these studies in the capacity of a significant factor of development of national human capital. The paper contains a research methodology developed and suggested by the authors for assessment of quality of human capital on the basis of analysis of the state of population enrolment in lifelong learning. The work incorporates an elaborated calculation of the corresponding index for ten countries of the world recognized as the leaders in the intellectualization of economy.

Keywords: Intellectualization of Economy; Human Capital; Quality of Human Capital; Lifelong Learning; Population

JEL Classification: F29; O15; H52

Contribution: The authors contributed equally to this work.

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**Інтелектуалізація економіки та якість людського капіталу
в контексті розвитку системи неперервної освіти**

Анотація. У статті здійснено комплексний аналіз таких складних феноменів сучасного суспільства знань, як «інтелектуалізація економіки», «людський капітал» і «неперервна освіта», в їх нерозривному зв'язку й в одному дослідницькому дискурсі. Обґрунтовано новітні конотації, що з'явилися в змісті цих категорій, із переходом до шостого технологічного укладу. Надано визначення інтелектуалізації економіки з урахуванням специфічних характеристик висококваліфікованої праці, що формуються системою неперервної освіти, яка, у свою чергу, виконує соціальну й водночас економічну та виробничу функції, що свідчить про амбівалентний характер освіти як суспільного й одночасно економічного блага.

Доведено, що при усій різноманітності існуючих індексів і здійснюваних за різними показниками досліджень інтелектуалізації економіки оцінка національної системи неперервної освіти й досі не використовується в них у якості вагомого фактору розвитку національного людського капіталу. Запропоновано авторську методику дослідження якості людського капіталу на основі аналізу стану участі населення в неперервній освіті. Здійснено розрахунок відповідного індексу для десяти країн світу – визнаних лідерів із інтелектуалізації економіки.

Ключові слова: інтелектуалізація економіки; людський капітал; неперервна освіта; населення.

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**Интеллектуализация экономики и качество человеческого капитала
в контексте развития системы непрерывного образования**

Аннотация. В статье осуществлён комплексный анализ таких сложных феноменов современного общества знаний, как «интеллектуализация экономики», «человеческий капитал» и «непрерывное образование», в их неразрывной связи и в едином исследовательском дискурсе. Обоснованно новейшие коннотации, появившиеся в содержании этих категорий, с переходом к шестому технологическому укладу. Дано определение интеллектуализации экономики с учётом специфических характеристик высококвалифицированного труда, формирование которых обеспечивается системой непрерывного образования. Показательно, что эта система выполняет социальную и одновременно экономическую функции, что свидетельствует об амбивалентном характере образования как общественного и, в тоже время, экономического блага. Теоретическая значимость представленного в статье исследования состоит в комплексном описании диалектики взаимосвязи интеллектуализации экономики и непрерывного образования (с акцентом на образовании взрослых).

Доказано, что при всем разнообразии существующих методик, применяемых в исследовании тех или иных аспектов интеллектуализации экономики, оценка национальной системы непрерывного образования до сих пор не используется в них в качестве весомого фактора развития национального человеческого капитала.

Предложена авторская методика исследования качества человеческого капитала на основе анализа показателей вовлечения взрослого населения в систему непрерывного образования. Осуществлён расчёт соответствующего индекса для десяти стран мира – признанных лидеров в интеллектуализации экономики. Проанализированы особенности систем непрерывного образования в Швейцарии, США, Швеции и Великобритании как наиболее успешных, согласно нашему рейтингу, стран. Обоснованы такие составляющие успеха этих систем, как разнообразие рынка образовательных услуг, лояльные программы кредитования для желающих обучаться, льготы и дотации от государства в комплексе с деятельной заинтересованностью работодателей.

Ключевые слова: интеллектуализация экономики; человеческий капитал; непрерывное образование; население.

1. Introduction

The dominant trend of contemporary economy is its intellectualization, with its integral component - knowledge-intensive production, intellectual and, specifically, human capital as a basis for generating knowledge and innovations. Building up the national innovative potential is directly related to the continuous process of empowering and enriching the population with knowledge. In the modern world with its rapidly growing level of information mobility the professional knowledge similarly becomes obsolete fast and is being replaced by a new one. As a consequence, reduction in the «half-life of professional competence»: in 1940s it constituted 12 years, in 1960s - 8 to 10 years, while in the first two decades of the 21st century it further reduced to 4-5 years for humanities-based and 2-2.5 years for technical-based professional skills (Daniel, 2020). Hence, the actualization of the notion of lifelong learning as a continuous creative reinvention, development and self-improvement of an individual throughout life. This notion correlates well with the concept of market economy which, due to exceptional mobility of its environment, compels people to learn continuously.

Lifelong education, according to the International Standard Classification of Education (ISCED), is realized within formal (institutionalized and bureaucratic system of educational establishments), non-formal (as a rule, flexible and dynamic vocationally oriented educational centers) and informal (unprompted, highly personalized educational centers) dimensions. With such a broad range of educational activities for a modern individual there is still no sufficient number of comprehensive studies which would regard the lifelong learning system as the factor of maximum engagement of the human capital into the processes of intellectualization of economy. This can be attributed to the complexity of diagnostics in the sphere of education that extends beyond the standard framework of formal education. Respectively, the majority of commonly accepted practices for assessment of the state of social and economic development of countries generally overlook (or insufficiently take into account) the educational activity of the adult population after completion of higher education. In this way, in numerous international indices, calculated both on international and national levels, an actual contribution into the intellectualization of economy of the educational constituent, which acquired continuous nature in the contemporary society, is not duly elaborated upon. Addressing this problem requires a comprehensive methodology at the level of global supranational association structures. In the presented paper it is proposed to employ as an «outline» of such research tool an author-developed methodology of assessment of the quality of human capital on the basis of analysis of the state of lifelong learning system.

2. Brief Literature Review

The stated range of problems of the presented study comprises three research «modules»: intellectualization of economy, human capital (as a constituent of national intellectual capital) and lifelong learning. For each one of them the foreign and the local scholars have formulated an extensive theoretical and methodological framework a complete analysis of which is impossible and inexpedient within the scope of the study. Only those works were considered relevant for the presented paper that combined all three said «modules» within a single research discourse or represented a relevant experience of assessing human capital in direct relation to educational activity. Regretfully, instances of a comprehensive study of human capital as a

driving force for intellectualization of economy, in the context of development of lifelong learning system, are scarce. Intellectualization of economy is predominantly postulated as a string of socioeconomic and technological transformations which are unquestionably synchronized with the educational activity. Nonetheless, there the issue, as a rule, addresses the quality and the accessibility of higher education (Kruss, McGrath, Petersen, & Gastrow, 2015; Djakons, R. & Lukianenko, D., 2020).

The problematic of the effect of education upon the formation and the development of human resources and human capital was first address by the Nobel laureates T. Schultz and G. Becker. The provisions of the theory of human capital developed by the two scholars lay the foundation for theoretical and applied studies on the range of problems related to management of organizational knowledge. The findings of these scientific researches are represented in the works by Argyris, 1982; Machlup, 1993; Nonaka & Takeuchi, 1995; Bukowitz, 1999; Prusak, 2001; Senge, 2006; Mokyr, 2018.

Among contemporary researchers on the problematics of interrelation between education and quality of human capital it is worth noting the following: Roos, Pike & Fernstrom, 2005; Raditloaneng, 2014; Kim, 2016; Roche, 2017; Bjursell, 2020; Eschenbacher & Fleming, 2020.

Overall, modern processes of intellectualization of economic activity form new challenges to an entire lifelong learning system as a significant factor of improving the competitive advantage of an individual in the information society, which reveals extensive prospects for further studies in the presented domain.

3. Purpose

Generalization of theoretical and methodological approaches to assessment of human capital within qualitative dimension and realization on this basis of comprehensive treatment of the dialectics of interrelation between the intellectualization of economy and lifelong learning; development of research methodology for quality of human capital on the basis of indicators reflecting the degree of formation of the lifelong learning system.

4. Methodology and Data

The methodological framework of the presented research consists in the principle of cognitive complementarity which enabled to conduct an interdisciplinary analysis of intellectualization of economy, human capital and lifelong learning as a significant phenomenon of information society; the paper utilizes general scientific methods of inductive logic, analysis, comparison, modeling, statistical and economic methods.

5. Results

5.1. Intellectualization of economy and lifelong learning: in search of determinacy

Current research on the innovation economy and the knowledge economy devotes considerable attention to the issues of intellectual capital and the use of intellectual resources which are being incorporated within a single common discourse of intellectualization of economy. In broad outline, this phenomenon is being interpreted as a certain instrument for developing the knowledge-based economy which allows to gain competitive advantage through raising the level of the organizational intelligence. At least three aspects of intellectualization of economy spring to mind: development of personality characteristics of the individual in the process of acquiring new experience and generating new knowledge; general intellectualization of infrastructural and industrial facilities; evolution of intellectual and information space - the Internet, communications media, etc. Such versatility of the denoted phenomenon complicates its interpretation significantly. Furthermore, even within the confines of each of three provisionally outlined aspects of intellectualization of economy, relatively distinct approaches to comprehending their content may be identified.

As an instance, if an individual is taken as the basis, intellectualization of economy is being interpreted as an objective-imperative process of formation and development of high moral foundations for economic activities and overall humanization of economic relations. It is being embodied in the striving of the majority of developed countries of the world for ensuring the production of the necessary material wealth while preserving the ecology and improving the quality of life of the individual. This concerns not only the provision of decent living conditions but also, first and foremost,

a continuous development of an individual and his non-economic life values. In other words, intellectualization of economy in such case constitutes the process of transition of economic relations into a qualitatively new level of value and conceptual essence.

Conversely, global-scale utilization of information technologies and implementation into the production of intelligence systems leads to automation of numerous processes thus resulting in considerable personnel reduction. As a consequence, there occurs a reduction in variable capital and labor costs. Robotic automation of a considerable share of both material and non-material production sectors does already cast doubts on the established humanistic paradigm where an individual, his intellectual needs and interpersonal relations are indeed in its very core.

Traditionally the phenomenon of «intellectualization of economy» is regarded from the standpoint of transformation of the intellectual labor into the material form. In such case, the processes of intellectualization find their manifestation in the increasing share of workers employed in the sphere of intellectual labor. It is namely them who generate new knowledge and reproduce it in technological, organizational and other innovations. However, the approach to intellectualization exceptionally from the standpoint of «materialization» of knowledge within a particular product is currently not as comprehensive anymore. It should be taken into account that one of the major trends of the contemporary economy is the increase in the share of non-material branches of production in the structure of GDP due to expansion of the tertiary sector, information sector. Simultaneously, juxtaposing the intellectual labor versus the manual labor, when the intellectualization of economy is being regarded as domination of intellectual work and actual forcing out from the social existence of any forms of physical work due to its mechanization and automation, is as well not acceptable in terms of describing current transformations of the economy.

In view of the authors of the presented work, the process of intellectualization of economy ought to be considered from the perspective of transformation of information and knowledge into both an economic resource and an economic good. In case of the former there occurs an increase in the share of knowledge-intensive production. The knowledge and, subsequently, innovations and knowledge-intensive technologies become a key factor of production which allows to collect intellectual rent and to ensure economic growth owing to the added value. In the latter case the point concerns potential opportunities which may be accomplished by individuals with the corresponding knowledge level. Hence, knowledge is already being treated as an economic good aimed at satisfying the needs of an individual for development.

Against the backdrop of global and extremely rapid transformations of the social consciousness stipulated by the evolution of fundamental theoretical concepts and specific technologies an increasingly great significance is allotted to common everyday knowledge of an average person, his own, independent «social construction of reality» (Berger & Luckmann, 1966).

In this vein the education is regarded by an individual as a natural «aide» in conceptualization and interpretation of new realities of life and orientation in those processes which occur on the societal level. This approach is elucidated in the sociological theory of post-industrial society by D. Bell. Bell deemed its defining feature to be the expansion of production of services and information (service society) and corresponding actualization of industries of trade, transport, health-care, science, education, entertainment. The work in the post-industrial society is first and foremost an interaction of personalities, their dialogue on the path towards reaching a consensus. While the primary objective of the industrial society was the physical survival, the priority for the post-industrial society rests upon the matter of quality and mode of living of an individual who does not devote himself to a single occupation but fulfils himself in various spheres of activity while engaged in continuous self-improvement.

Describing the post-industrial society, D. Bell draws special attention to its defining parameters such as a pivotal role of theoretical knowledge, creation of new intelligence-based technologies, increase in the class of knowledge holders, emergence of new structures where the key role will be played by scientific communities. As a consequence, «emergence of new axial structures and principles: the transition from a commodity-producing society to an information society or knowledge society, ... the shift along the abstraction axis from empiricism or trial-and-error tinkering to theory and the codification of theoretical knowledge which would be used to direct innovation and formulate policy». In this context the education is the «search for interrelations in the disorganized world of knowledge» (Bell, 1973).

The economy has acquired new outlines in the society: intangible goods - information and services - gained higher market value than material goods which stipulated significant growth

of the service sector when compared to the real sector; knowledge and innovations have become the major source for growth of added value; the nature and form of labor have changed, diversification, fragmentation and individualization of work have come to pass; expenditures for education and healthcare have increased; a demassification of production brought about further changes in the system of social values. In a consolidated form, transformations in the content of key social and economic categories in the process of intellectualization of economy are represented in the Figure 1.

Intellectualization of economy	
Individual	Intelligence is a major competitive advantage of an individual. The scope of knowledge is growing rapidly forcing an individual to engage in lifelong learning. Independent construction of social reality is being actualized.
Knowledge	Applied knowledge acquires central priority. Knowledge becomes an economic good. Knowledge is a source for technological, organizational, management and other innovationsю
Labor	Considerable decrease in the share of manual labor. Labor productivity is increasing, its diversification is occurring. Expansion of the service sector utilizing information and communications technologies.
Investment	Growth in the scope of individual's investment into the development of his intelligence. Increase in investments into scientific and research activities. Increase in government investment into adult education.
Information	Increasingly more information is required to perform labor. functions, information is being continuously updated. Information is a subject of trade and competition.
Economic resources	The major economic resource is knowledge. Growing share of intellectual property in enterprise resources.
Economic Growth	Determined by the rates of human capital accumulation and development of high-technology sectors of economy.

Figure 1:
Transformations in the content of key social and economic categories stipulated by the intellectualization of economy
Source: Developed by the authors

Therefore, intellectualization of economy is an indicator of quality and an imperative of economic growth, it is based upon a specific institutional structure which stipulates prioritization of intellectual property, creative labor, knowledge-intensive production, lifelong learning and growing needs of an individuals for self-realization.

Generalizing the existing views concerning the intellectualization of economy enabled the authors to regard it as a transition to a new, sixth techno-economic paradigm (according to the theory by N. Konratiev) with its core being the overall human capital that is capable of satisfying the growing needs of high-technology sectors of economy (quantum technologies, nanoelectronics, photonics, micromechanics, fusion energy sector).

An unquestioning condition for respective development of the human capital is the «lifelong learning» (hereafter - the LL). The broad use of this concept in various studies and government documents alike is not always followed by the transparency and unambiguity of its perception. It is considered that the concept of the LL was first scientifically substantiated in 1929 in the work titled «Lifelong Education» by B. Yeaxlee - one of the vocal proponents of the adult education in Great Britain. Another no less well-known work on this subject matter is «The Meaning of Adult Education» by Eduard C. Lindeman, first published in 1926. Therein it was in fact for the first time proclaimed that «education is life» and «the whole of life is learning, therefore education can have no endings». Strictly speaking, within the framework of these two seminal works in the early 20th century an intellectual foundation was formed for an all-round study of education as a continuous, lifelong aspect of an everyday life of an individual. The «palm branch» of primacy in this subject is given to P. Lengrand who introduced the concept of the LL to UNESCO back in 1975. The concept embodied a humanistic idea that «person is at the centre of all educational endeavours» as well as substantiated an inexpedience of dividing the life into the periods of study, labor activity and professional disactualization.

Subsequently, the concept of the LL found its manifestation in the documents by three major international organizations: OECD, UNESCO and the European Council entitled «recurrent education», «éducation permanente» and «adult education», accordingly. The presented documents were unified by a common concept - creation of consistent strategies to ensure the opportunity for all people to engage in lifelong learning.

Initiated by the Heads of State European Council in 1997, the European Employment Strategy (EES) was based on 4 main underlying premises: employability, entrepreneurship,

adaptability and equal opportunities. The Strategy provides the following definition of the concept of LL: «all purposeful learning activity undertaken on an ongoing basis with the aim of improving knowledge, skills and competence». Shortly after, in 2000 during the European Council Summit in Lisbon an initiative was introduced regarding the creation of an all-European system of the LL which served as an acknowledgement of Europe irrevocably entering the age of the «society of knowledge» and, as a consequence, of global cultural, economic and social transformations in modern societies.

5.2. Approaches to the assessment of quality of human capital (QHC) at the intergovernmental level

After achieving a particular critical level of education and adaptability, the society undergoes changes in its consumer preferences towards a higher intellectualization of the obtained goods which serves as an impulse to the advancement in processes of intellectualization of economy, in general. It is no exaggeration to assert that over the past 30 years, during which the globalization and the information and communications revolution acquired an avalanche-like pattern, the system of LL has matter-of-factly become a branch of the knowledge economy. High rate of aging of professional knowledge as well as high dynamics of creation and diffusion of new knowledge led to a considerable reduction in the «half-life of professional competence».

As already mentioned, the degree of intellectualization of economy is being determined by the quality of human capital which is ensured through the improvement in the level of education. However, despite an apparent direct correlation between development of human capital and intellectualization of economy, there is still an issue pending: what causes a decline of macroeconomic indicators in many countries of the world against the backdrop of growing indicators of education enrolment and individual engagement for the purpose of obtaining the said education. For instance, in the study on educational systems where the principal indicator is represented by quantitative indicators, e.g., Education Index 2020, Ukraine is positioned next to the most powerful economies of the worlds in the 47th position (among total of 189) with the value of 0.799. To compare, the UAE is listed 46th (0.802), France - 41st (0.817), Russia - 39th (0.823). Further to it, according to the study of Global Human Capital 2020, Ukraine has the index of 0.65 similar to the indicators of China and Turkey. Nonetheless, the comparison between the state of economic development of these countries and Ukrainian economy is not in favor of the latter. As an instance, the GDP of Ukraine in 2021 constitutes USD 576.10 billion while the GDP of China is USD 16,642.32 billion and the GDP of Turkey is USD 2,749.57 billion, respectively. These figures attest: the available educational potential in our country is not being capitalized in a befitting way.

Hence, existing research methodologies do not reflect actual indicators of quality of education which may be extremely low in particular countries. Furthermore, they do not expose the existing distinction between the countries in terms of access to education and its duration. It is deemed more representative to address the studies where the main emphasis is placed on the quality of education and opportunities for obtaining it. For example, the CEOWORLD magazine conducted a comparative analysis in 2020 between 93 countries of the world according to 16 indicators incorporated into two categories: «Quality Index» (public education system, willingness to attend university, number of research institutions, university funding and endowment, industrial linkage, academic educational professionals effectiveness, institutional output by research, higher education institutions performance in various global rankings) and «Opportunity Index» which, in its calculation, accounted for adult literacy rates, graduation rates, primary, secondary and high school completion rates, government expenditure on education. Indicators of the top 10 countries according to the presented study in correlation with the data on their economic development (GDP, development of innovations, education expenditures) are provided in [Table 1](#).

Coherence between the data on the quality and the opportunity (identical indicators according to both indexes with negligible discrepancies) in the study by the CEOWORLD (hereafter, the EI - Education Index) was established with 4 out of 10 top countries: Australia (70.5 - 67.52), Sweden (70.1 - 66.96), France (69.9 - 66.3) and Switzerland (68.3 - 60.12). The largest discrepancy between the Quality index and the Opportunity index is manifested by Great Britain and Germany.

The data obtained in the course of the comparative analysis testify to zero correlation between the indicators of the EI and education expenditures as a share of GDP. The only exception may be

Table 1:

Quality of education and opportunities of obtaining it in correlation with economic indicators (top ten countries according to CEOWORLD)

Country	Quality Index	Opportunity Index	Rank EI	Global Innovation Index 2020 (rank and score)	GDP	Expenditure on Education,
					Nominal, billions of U\$D, 2021 (rank and score)	% GDP (rank and score)
United Kingdom	78.2	69.79	1	4 (59.8)	5 (3 124.65)	22 (45.9)
United States	72	68.74	2	3 (60.6)	1 (20 932.75)	43 (39.0)
Australia	70.5	67.52	3	23 (48.4)	12 (1 617.54)	33 (43.1)
Netherlands	70.3	67.21	4	5 (58.8)	17 (1 012.60)	23 (45.8)
Sweden	70.1	66.96	5	2 (62.5)	24 (625.95)	3 (74.4)
France	69.9	66.3	6	12 (53.7)	7 (2 938.27)	30 (43.4)
Denmark	69.8	62.54	7	6 (57.5)	36 (392.57)	4 (73.9)
Canada	69.8	61.01	8	17 (52.3)	9 (1 883.49)	32 (43.1)
Germany	69.5	60.64	9	9 (56.5)	4 (4 319.29)	50 (36.9)
Switzerland	68.3	60.12	10	1 (66.1)	18 (824.73)	40 (41.0)

Source: The world's best countries for the education system, 2020 (for data CEOWORLD):

<https://ceoworld.biz/2020/05/10/ranked-worlds-best-countries-for-education-system-2020> ;

Global Innovation Index 2020: <https://www.globalinnovationindex.org/analysis-indicator> ;

GDP, 2021: <https://statisticstimes.com/economy/projected-world-gdp-ranking.php> ;

Government operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment, as a percentage of gross domestic product (GDP):

<https://www.globalinnovationindex.org/analysis-indicator>

witnessed in the case of Sweden which ranked 5th in the EI and 3rd by the indicator of education expenditures. With regard to other countries, the first in the top ten countries by education - Great Britain - ranks 22nd by education expenditures as a share of GDP while USA and Australia (2nd and 3rd according to the EI, respectively) are ranked 43rd and 33rd, accordingly. An insufficiently explicit connection is as well traced in the correlation between the EI and the GDP of countries. For instance, only three out of the top ten examined countries display a discrepancy in only one point of ranking according to these two parameters - USA (2 and 1, respectively), France (6 and 7), Canada (8 and 9). Probability of problems with capitalization of the educational potential is attested to by a considerable distinction between the said parameters in such countries as Australia (3 and 12), the Netherlands (4 and 17), Sweden (5 and 24), Denmark (7 and 36). A less striking contrast exists between the indicators of the EI and the Global Innovation Index in the overwhelming majority of countries from the studied top ten, with the exception of Australia, France, Canada. The indicators of Germany according to these two indexes are identical - it ranks 9th.

The explanation for discrepancies between the indicator of educational development and data on economic development (in this particular study as well as many others), in our view lies in the fact that researchers fail to pay adequate attention to the factor of impact of the lifelong learning system on the formation of the human capital.

In a broad sense, human capital is a certain reserve of health, knowledge, skills and expertise, motivations, formed as a result of investments and accumulated by an individual, which he effectively employs in the process of labor activity thus contributing to the increase in labor productivity and income. T. Schultz was the first to use the term, followed by his successor G. Becker who further developed the concept by substantiating the effectiveness of investments into human capital. It must be noted that human capital is furthermore an intensive productive factor of economic development which incorporates the educated part of labor resources, knowledge, tools of intellectual and management activity as well as the environment required for efficient functioning of human capital.

The authors of the presented work proceed from the premise that human capital as an integral part of intellectual capital constitutes a sum-total of knowledge, skills and experience formed by means of investments that allows to generate income and in general provide positive externalities for state and society. Its key element is the education comprised of formal, corporate, further and informal (with three latter being the forms of lifelong learning). Assessment of human capital essentially makes use of three approaches: the cost-based approach; the income-based approach; the indicators-based approach. It should be emphasized that within the traditional theory of human capital the subject of research was primarily the formal education. For instance, Schultz (1962), the advocate of the first approach, performed the assessment of human capital by estimating public and private expenditure on formal education. For Becker (1962) the key parameter in studying human capital was the enrolment rate in formal education. Similarly,

Barro (2013) in his works utilizes the indicator of the average level of formal educational attainment among the population aged 15 to 74.

In the modern human capital theory, the «level of formal education» is being replaced by qualitative characteristics. In particular, Hanushek (2006) uses the TIMSS and PISA test results as indicators of cognitive skills within human capital which allows to substantiate wage differences between employees with the same formal educational attainment. Furthermore, in his view, assessment of human capital must take into account the data related to effectiveness of economic and state institutions. Criticizing Hanushek's approach, Heckman and Kautz (2012) stress the significance of non-cognitive i.e., personal, characteristics that reflect the capacity of an individual for learning. In their study researchers suggest the theory of «Big Five» personality traits: extraversion, agreeableness, emotional stability, conscientiousness, openness to experience. However, assessment of the quality of human capital according to these indicators poses certain problem considering the absence of system research on the degree of development of these non-cognitive competences among the population.

Overall, assessment of the quality of human capital lacks unanimity whereas the diversity of approaches and methodologies significantly complicates the analysis of the contemporary state of intellectualization of economy within both national and global dimension. Furthermore, each of three aforementioned approaches has its shortcomings. For example, the market value of capital is determined not so much by the volume of investment as by the demand for said capital. Therefore, there exists no explicit dependence between the scope of investments into human capital and its value. This problem is further exacerbated by the fact that raising individuals with poorer health or lower cognitive abilities requires higher expenditures in comparison to healthier and more gifted ones. Respectively, the cost-based approach may lead to an overstatement of the value of human capital for the former and its understatement for the latter. The second approach stipulates accounting of reinvested profit sensitive to the discount rate and the working age duration. Apart from this, data on profits is less accessible than the data on investments into training of specialists. This particularly concerns the countries with transition economies where it is generally impossible to establish real values of wages.

In the view of the authors of the presented work, these two listed approaches cannot be utilized for development of diagnostic procedures related to intellectualization of economy, particularly in terms of formation of human capital by means of lifelong learning. As an instrument of assessment, the indicators-based method will be implemented which itself is not rid of shortcomings. This concerns utilizing average indicators of the state of human capital development in the countries of the world. Moreover, harmonization of certain criteria, specifically the quality of education, for countries that are fundamentally different in the level of literacy of their populations (e.g., Great Britain and Somalia) may lead to non-objective, biased assessment.

Assessing the human capital, the World Bank summarizes quantitative indicators in the form of the **Human Capital Index** which reflects the contribution of healthcare and educational systems to the development of labor productivity of next generations of workers. The index is intended to measure the potential of human capital which can be accumulated by a child, taking into consideration the conditions for preserving health and obtaining education that exist in the corresponding country. Hence, it references quality of potential human capital that will be employed within the economy after a specified number of years. In the assessment of human capital, the authors of the presented work deem it necessary to focus not on potential abilities of the younger generation, but on the adult population with heavy emphasis on the factor of lifelong learning.

Another widely recognized research tool for studying national human capital is the **Human Development Index** compiled within the framework of the UN Development Programme (UNDP). It is comprised of the sub-index of life expectancy; sub-index of education (access to education with calculation of expected years of schooling for school-age children and adult population); sub-index of gross national income (GNI) per capita in US dollars in purchasing power parity (PPP\$). It must be noted that this index is based on quantitative indicators.

The qualitative indicators are extremely seldom utilized. For instance, these may be found among the data of the Programme for the International Assessment of Adult Competencies (PIAAC) or the Programme for International Student Assessment (PISA) the results of which demonstrate the state of development of key competences among adults: reading, mathematical, scientific literacy. Consolidation of social and economic data is also performed by UNESCO (within the framework of «Sustainable Development Goals» programme), OECD, World Bank and others.

The Social Progress Index is aimed at measuring the achievements of countries in the domain of social development. It incorporates 51 social and economic indicators that reflect the level of meeting basic human needs, level of wellbeing and opportunity. This index only indirectly addresses the quality of human capital through indicators of the state of social institutions in a country.

Global Innovation Index is a tool for assessing the efficiency of innovations in the economy composed of 80 indicators. It incorporates the Innovation Input Sub-Index (institutions, human capital and research, infrastructure, internal market and business development) and the Innovation Output Sub-Index (knowledge economy and technology progress, development of creative activities). Namely this index might prove the most useful in assessing the state of intellectual capital of the country.

In all diversity of existing indices and researches on intellectualization of economy, conducted according to various indicators, the assessment of the national system of lifelong learning is still not used within their scope as a substantial factor of development of national human capital. Among obvious reasons for it is the complexity of monitoring statistical data related to the process of learning of a modern individual after completing his formal education. As a general rule, such data is concentrated on corporate resources the access to which on the part of government entities and international organizations, interested in such kind of monitoring, might be complicated.

A relatively successful attempt at determining weaknesses and strengths of the lifelong learning system in a particular country on the basis of indices is the «Global lifelong learning index» (2016) ranking by the Korean researcher Kim. The ranking incorporates four pillars: Learning to know, Learning to do, Learning to live together, Learning to be. The indicators according to these pillars are formed on the basis of two indices: the European lifelong index (ELI) and the Global lifelong index (GLLI). The pillar of «Learning to know» includes among others such indicators as enrollment in primary, secondary and higher education, education expenditures as a share of GDP, position in university rankings, etc. According to the «Learning to do» pillar Kim suggests to take into consideration the output of formal vocational education and participation in non-formal educational process; supply and capacity of enterprises in terms of providing non-formal education to employees (continuing vocational training courses, other forms of employee training and their availability); degree of integration of learning in the work environment. The third pillar includes such indicators as participation in active citizenship; tolerance, trust and openness; inclusion in social networks. The fourth pillar - «Learning to be» - opens up on the potential of the country population to participate in learning through sports and leisure activities, use media and the Internet for learning as well as on the ability to achieve work-life balance. Altogether the «Global lifelong learning index» ranking spans 81 countries. The top ten countries are as follows: Norway (1), Australia (2), Iceland (3), Denmark (4), Switzerland (5), Finland (6), USA (7), the Netherlands (8), Sweden (9), Canada (10). It is noteworthy that Ukraine ranks 47th, being 12 positions ahead of China (ranked 59th, correspondingly).

The authors of the presented work consider the shortcoming of Kim's suggested methodology for assessment of the lifelong learning system to be the combination of the cost-based and the indicators-based approaches, in particular the inclusion into the pillar «Learning to know» of the «expenditure on education» criterion. Furthermore, an important indication of success of the studied system could have been the inclusion of the indicator of the duration of adult population learning.

In summarizing the most universally adopted approaches and methodologies of assessing the quality of human capital, including the context of development of the lifelong learning system, it is possible to reach a conclusion on the necessity to account for the following conditions in respective researches:

- A key role of parameters that reflect the state of the lifelong learning of the population (indicators of formal / non-formal, corporate education);
- A harmonized combination of quantitative and qualitative characteristics of human capital.

5.3. Methodology of studying the quality of human capital as a key marker of intellectualization of economy on the basis of analysis of the state of participation of the population in lifelong learning (hereafter, the QHC (LL) study methodology)

Intellectualization of economy is a process that stipulates broad involvement in the production process of creative individuals capable of generating new ideas for the purpose of increasing the labor productivity as well as systematic implementation of innovations. Therefore, the

first criterion selected in the study of *QHC (LL)* is «*Innovation*». It comprises the following indicators:

- 1) University Ranking Average score of Top 3 Universities (*UR*);
- 2) ICT Use;
- 3) University / Industry Research Collaboration (*UI RC*);
- 4) Scientific and technical publications (Number of scientific and technical journal articles (per billion USD PPP GDP) - *STP*).

Data according to these 4 indicators are formed on the basis of the Global Innovation Index (GII). The criterion of «*Openness to lifelong learning*» (formed on the basis of the data by the Organisation for Economic Co-operation and Development (OECD) incorporated the following indicators:

- 1) Share of enterprises that provide courses or other forms of lifelong learning (*EPT*);
- 2) Preparedness to participate in formal and / or non-formal education (*WPFnFE*);
- 3) Share of adults (aged 25-64) involved in non-formal education and learning (*PEAPnFE*).

The criterion of «*Development*» reflects the data from the Human Development Index (*HDI*). This index has been essential to the presented study with consideration for availability of data on expected and mean years of schooling of children and the adult population presented in it.

The authors of the presented work conducted the assessment of the human capital in national economies (*QHC (LL)*) on the basis of analysis of the state of country population enrolment in lifelong learning by calculating an average indicator according to the specified criteria, with value ranging from 0 to 1.

The obtained *QHC (LL)* values on the development of education in top ten countries (according to the «CEOWORLD» data, presented earlier in the paper) are provided in Table 2.

Table 2:
**Quality of human capital
(based on key indicators of development of the lifelong learning system)**

Country	Innovation				Openness to LL			Development	Indicator	Rank
	Global Innovation Index (GII)				Adult education and learning (OECD)			HDI		
	UR	ICT Use	UI RC	STP	EPT	WPFnF Ed	PEAPnF EdT			
	0-100				0-1			0-100	0-1	
United Kingdom	95.7	86.5	69.0	65.6	86.0	0.7	55.0	0.93	0.789	4
United States	98.6	81.1	75.7	27.3	84.0	0.8	68.0	0.93	0.795	2
Australia	79.8	79.2	50.4	76.2	58.0	0.6	65.0	0.94	0.725	7
Netherlands	67.4	86.0	74.4	57.8	85.0	0.5	72.0	0.94	0.728	6
Sweden	59.3	86.2	71.0	83.3	93.0	0.7	63.0	0.94	0.790	3
France	69.6	82.8	58.5	42.2	79.0	0.4	58.0	0.90	0.650	9
Denmark	57.4	90.3	69.1	100	87.0	0.7	51.0	0.94	0.789	4
Canada	78.9	77.4	65.9	57.4	65.0	0.5	64.0	0.92	0.695	8
Germany	70.1	80.3	70.7	43.5	77.0	0.7	56.0	0.94	0.741	5
Switzerland	83.0	88.8	77.5	93.7	89.0	0.7	72.0	0.95	0.833	1

Source: UR, ICT Use, UI RC, STP: <https://www.globalinnovationindex.org/analysis-indicator> ;
EPT, WPFnFE, PEAPnF EdT: https://stats.oecd.org/Index.aspx?DataSetCode=EAG_AL ;
https://stats.oecd.org/Index.aspx?DataSetCode=EAG_AL# ;
HDI: http://hdr.undp.org/sites/default/files/hdr2020_ru.pdf

To calculate the indicators of those countries and establish their respective ranking, a formula was used with corresponding data on the indicators of *UR*, *ICT Use*, *UI RC*, *STP*, *EPT*, *PEAPnFE* being standardized to amount 1:

$$QHC (LL) = \left(\frac{UR + ICTUse + UI RC + STP + EPT + PEAPnFE}{6} / 100 + (WPFnFE + HDI) / 2 \right) / 2. \quad (1)$$

Top three countries in terms of *QHC (LL)*, according to authors' methodology, includes Switzerland (1), USA (2), Sweden (3). It is noteworthy that in the study by the «CEOWORLD» (that predominantly reflects the state of higher education development) Switzerland was ranked 10th. Such composition of the leaderboard is completely natural taken into account the policies of these countries in the sphere of the *LL*.

The secret to success of the Swiss lifelong learning system (which was ranked first in our rating) lies in the diversity of the market of educational services. The range of their suppliers varies from small private schools to powerful enterprises, from government entities, associations, trade

unions to small studios and independent instructors. In absolute figures private providers are clearly dominating: they supply approximately 80% of the total quantity of learning hours whereas state providers - first and foremost, universities - account for only 20%.

In USA the education constitutes one of the most potent industries in the world. In 1976 the US government adopted the Lifetime Learning Act where the main focus was placed on the education of adults. It also emphasized the top priority of helping citizens adapt to social, technological, political and economic changes. The philosophy of lifelong learning in USA is built upon the society's understanding of the importance of any educational efforts (on professional level and in daily life, formal and non-formal, realized through traditional methods or by means of state-of-the-art technologies) and stable financial backing on the part of federal governments. Further to it, the American system of *LL* is characterized by its accessibility to any types of education (for all citizens), flexibility and variability.

In 1977 Sweden conducted a reform of higher education which implemented numerous advancements into the system of *LL* which were enshrined in new organizational forms and structures. Conditions for admission to higher education institutions were liberalized, the age limit was cancelled, the working experience of the applicant had become a selection criterion tantamount to a high school general certificate, quotas were introduced for citizens aged 25 and over with previous working experience. In the course of a year every one of two Swedish citizens is enrolled in some form of learning on various educational platforms.

The practice of financial support for the system of *LL* in Great Britain merits attention. There, continuing professional education is provided in accordance with the following schemes: 1) an enterprise organizes it, at its own expense, as internal training or with the involvement of third-party private organizations; 2) partly at public expense (75% is funded by the Further Education Funding Council), partly - at the expense of the enterprise (25%); on the personal initiative of the worker at his own expense simultaneously with the opportunity to obtain certain benefits and reimbursements on the part of the state. Presently, there exist several government programmes for support of *LL* at the enterprises, in particular «Skills for small businesses» for enterprises with less than 50 staff members, where payment of interest on loans is undertaken by the Department for Education of the UK and the repayment of loan can be deferred for a term of 6 to 12 months. Similar by its preferential terms is the programme «Budget for support of local competitiveness». Another type of organization of learning has acquired wide circulation in the form of «franchising» («education subcontracting») when a college together with an employer organize joint programmes with combined funding. Private individuals may obtain state funding through following programmes: «Career Development Loan» (bank loan with deferred repayment), «Professional Development Loan» (coverage of expenses for education from the amount of tax paid by the private individual if the education is completed with the obtainment of national professional qualification); «Individual learning accounts» (the state transfers into the allocated account of the private individual a specific amount which this individual supplements with approximately 20% of his own funds).

6. Conclusions

Intellectualization stipulates the acknowledgement within the economy of the key role of knowledge in comparison to other productive factors. The principal subject of generating it is represented by human capital, the development of which is ensured on the basis of lifelong learning system. Hence, the degree of intellectualization of economy is being determined by the quality of human capital, generation and accumulation of which is being realized through formal, non-formal and informal education. Correspondingly, the state of development of the lifelong learning system is one of determinative markers of competitiveness of national economies.

Theoretical relevance of the conducted research lies in the generalization of theoretical and methodological approaches to assessment of human capital in its qualitative dimension as well as in the comprehensive treatment of the dialectics of interrelation between the intellectualization of economy and lifelong learning.

At the level of practical application, an implementation was granted to the author-developed methodology of assessment of the quality of human capital proceeding from the indicators of development of national lifelong learning systems. The advantage of the given methodology consists in the fact that it stipulates, first and foremost, the evaluation of the effectiveness of universities as key suppliers of educational services for various age and professional categories of the population as well as their involvement into cooperation with industry and different types of commercial

organizations; secondly, it consists in the preparedness and actual enrolment of adult population in various forms of lifelong learning as well as the capacity of enterprises to ensure such learning for their employees. Hence, the estimation must be conducted on the potential for formation of human capital within two major educational focus points - university-based and professional. The *QHC (LL)* research methodology further includes indicators that indirectly reflect the quality of human capital by means of indicators of ICT use, number of scientific and technical publications. The human Development Index (HDI) was used as a part of the methodology with the purpose of accounting the data with regard to expected and mean years of schooling of children and the adult population. Indicators of ten countries, which were subject to analysis according to the author-development methodology, attested: leading positions in the *QHC (LL)* ranking are occupied by countries where the issue of improvement of professional level is systemically addressed and watched over by employers under prudent incentive grant policy of the state.

Taking into consideration that there exists a demand in the society for supplementary studies which would incorporate the aftermath of the pandemic as well as structural changes that occurred in the economy due to the transition to the sixth techno-economic paradigm, the propose methodology may be employed by international institutions as a tool for assessing the state of economic development of particular countries and their comparative analysis; by government entities - to formulate external and internal policy; by the corporate administration and other subject matter experts - to develop diagnostic procedures and recommendations on improvement of continuing professional training and development of specialists

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