

Methodology for Assessing the State of Human Capital in the Context of Innovative Development of the Economy: A Three-Level Approach

Zaure K. Chulanova¹, Azimkhan A. Satybaldin², Amanzhol K. Koshanov³

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Abstract

The purpose of the study is to analyze the main approaches to assessing human capital and develop proposals for its most objective assessment of it at the different levels of manifestation - individual, microeconomic and macroeconomic. The article considers the basic approaches to the evaluation of human capital, used in practice: retrospective (costly) and prospective (income based). Cost based methods involve measuring the value of human capital based on the total costs associated with its formation. The proposed additional evaluation criteria, in particular, the use of the expert approach and the developed indicators of a qualitative assessment of the human capital of the enterprise will allow development that is more efficient and use of available human resources. Human capital is becoming a major factor in the formation and development of an innovative economy and knowledge economy. Accordingly, the proposed additions to the assessment of human capital at the country level are aimed at assessing it from a new angle, taking into account the current global trends in the formation of an innovative economy and digitalization. They meet qualitatively new requirements for human capital as the main productive factor in the creation of new highly efficient technologies that promote the active development of the social sphere, science, education, health, etc.

Keywords: Human Capital, Economic Valuation Methods, Innovative Economy, Expert Quality Assessment, Human Resources Management

JEL Classification Codes: E24, J24.

1. Introduction

A characteristic tendency of the last decades in the economy is a fundamental overestimation of the productive forces, conditioned by a global trend towards innovative development. Gradually, the role and importance of material capital yields to the primacy of the abilities and skills of a person, his high professionalism and competencies. In the context of the growing role of science-intensive technologies, high-tech production, and the IT industry, the priority of the

modern economy is the attraction, accumulation, development and retention of human capital as the main factor of economic growth and the basis of the state's competitiveness in the global economy.

The concept of human capital is one of the most promising areas of development of economic science in the 21st century. Its supporters understand by human capital the amount of knowledge, skills, motivations, abilities and health formed as a result of investments and accumulated by person, which contributes to the growth of the labor productivity and income of this person. In the framework of the modern theory of human capital, not only the amount of investment in human capital, but also the volume of human capital accumulated by an individual is estimated.

The economic literature uses a wide variety of approaches to assessing human capital. At different times and in different conditions, scientists offered a variety of methods for measuring them. At the same time, in terms of the innovative economy, the indicators of the level of higher education and professional training of specialists, the mobility of both the geographical and professional and the

1 First Author and Corresponding Author. Chief Researcher, Institute of Economics of the Ministry of Education and Science; Professor, Al-Farabi Kazkh National University, Almaty, Kazakhstan. [Postal Address: 29 Kurmangazy Street, Almaty, 050010, Republic of Kazakhstan] E-mail: zaure.ch@mail.ru

2 Professor, Institute of Economics of the Ministry of Education and Science of the Republic of Kazakhstan.
E-mail: ieconomkz@gmail.com

3 Professor, Institute of Economics of the Ministry of Education and Science of the Republic of Kazakhstan,
E-mail: ieconomkz@gmail.com

qualitative characteristics of workers generating the modernization of public consciousness, come first in terms of their impact on the qualitative development of human capital.

On the basis of the foregoing, it is possible to draw conclusions about the need for further development of theoretical frame to the objective assessment of human capital in accordance with modern requirements. The purpose of the study is to analyze the main approaches to assessing human capital and develop proposals for its most objective assessment of it at the different levels of manifestation - individual, microeconomic and macroeconomic.

2. Literature Review

Despite the fact that the modern concept of human capital was developed half a century ago, scientists have been interested in the formation, accumulation, development and effective use of human capital for many decades. Even economists of the XVII century explored the possibility of including in the fixed capital the formed useful abilities of man to work. The tendencies of the development of the last decades put this problem at the center of economic science and practice. A high-tech economy, characterized by accelerated rates of technological modernization, both in the sphere of production and services, has brought to the forefront the problem of generating intelligent products. Under these conditions, the main parameters of the socio-economic development of countries are characterized by indicators of the quality of human resources. The analysis of the existing methodological approaches to the assessment of human capital has made it possible to identify two main ones: a retrospective based on the costs incurred in its formation, and a prospective one based on the accounting of the revenues of which it will become a source.

2.1. Methods of Assessing Human Capital based on the Costs of Its Production

This approach first used by Ernst Engel to estimate the cost of the birth and upbringing of children for their parents, which was determined by him in the form of total expenses for the maintenance of children until they reached adulthood. In his calculations, the scientist proceeded from the unequal cost of childbirth for people from different social strata, further assuming an annual increase in the cost of maintaining the child in the arithmetic progression as his age increased (Engel, 1883). Obviously, this approach aims not so much at assessing human capital as at assessing the

cost of keeping a person as a physical being. In addition, it did not take into account the costs of society as a whole related to the birth and upbringing of children; it ignored the time spent by parents caring for children. Also, since the costs of keeping children of different ages were produced at different time periods, therefore, they could be summed up only taking into account the level of past prices

John W. Kendrick, using statistical data, made an attempt to calculate the accumulation of investments in people by including in the human capital the costs of the family and society for the upbringing of children before they reach working age and getting education, specialization, advanced training, health, labor migration, and housing costs, household durables and others (Kendrick, 1974). These studies conducted to develop reference tables for the life insurance industry, for calculating the magnitude of claims for compensation for loss of life.

The founder of the theory of human capital, Theodore Schultz, considered education as a key factor in the growth of the value of human capital. He noted that since one form of capital is education, it is called human capital because it becomes part of the human being, and capital is because it represents the source of future satisfaction or future earnings, or both (Schultz, 1971).

The World Bank has proposed a formula for calculating human capital that determines its relationship with investments. According to this approach, human capital is a function of the product of the labor quality index in its broad definition, the quality index of accumulated human capital, investment in human capital and other variables. The latest calculations made by experts of the World Bank include consumer spending - the cost for families of food, clothing, housing, education, health, culture, as well as government expenses for these purposes.

Without a doubt, these approaches, based on the costs of human capital production, take into account many factors that affect its formation, but they also have certain drawbacks. In particular, it is assumed that the value of human capital is determined entirely on the supply side without any participation of demand factors. It also does not take into account that when measuring human capital, unlike physical capital, there is no unequivocal stable relationship between the amount of invested funds and the final results of their investment. For example, the maintenance and upbringing of less healthy or less able children costs the parents more than the healthier and more able. However, it does not follow from this that the former will have greater human capital than the latter. Usually the situation is reversed. In such circumstances, the use of a cost-based method leads to an overestimation of the human capital of people with poor health or lesser abilities, and

underestimation of their level in people with good health or better abilities.

In addition, when using this approach, it is not taken into account that the depreciation and depreciation of human capital is fundamentally different from the depreciation of physical one. In the process of activity, as the workers grow older and their professional experience is accumulated, the economic value of their available knowledge, skills and abilities does not decrease, but increases, in contrast to physical capital.

Among the shortcomings is the fact that it does not take into account the length of time investments in a person. The stage of investment in human capital and the period of its use often have a certain time lag. In modern society, a significant portion of investments are made in school and student years, when a person still has some time to remain in the education system and human capital is still far from the beginning of its active "use."

2.2. Methods of Assessing Human Capital based on Income Derived from the Use of This Capital

Sir William Petty was the first to attempt human capital valuation in terms of income. He calculated the annual wage bill, defining it as the difference between national income and property income. Then, dividing the value obtained by the interest rate, calculated the stock of human capital (Petty, 1691).

Another English economist, William Farr, formulated the key idea that capital embodied in individuals can be measured by the total income they will receive in the labor market over the course of their lives. He estimated human capital as the capitalized value of the future earnings of individuals after deducting their costs of maintaining themselves, and representing wealth that should be taxed, according to physical property (Farr, 1853).

A great deal of attention was paid to the assessment of human capital by G. Becker, who carried out a statistical calculation of the economic efficiency of education. Thus, in order to determine, in particular, the income from higher education, they were asked to deduct from the lifelong earnings of employees who had graduated from college, lifelong earnings of those whose education level was not above the high school (Becker, 1964). Becker, considering the worker as a combination of one unit of simple labor and a certain number of embodied "human" capital, determined his wages (income) as a combination of the market price of his simple labor and income from investments invested in a person. Moreover, the main part of the income to the

employee, according to Becker, as well as the calculations of other researchers, is brought by human capital.

Lester C. Thurow used the method of capitalization of earnings to assess human capital. He proposed to measure the value of human productive capacity indirectly, using market values for which they can be rented (Thurow, 1970). In the works of Milton Friedman, human capital means a part of property, a certain fund, that provides uninterrupted income. This income can be represented as a discounted wage (given at the current moment by the weighted average amount of annual earnings) received by the employee during the entire working life period (Friedman, 1999).

It should be noted that today the method based on the calculation of total income is widely used in economic and social sciences. In general, an undoubted advantage is that when it is used, human capital stocks are valued at market prices. The wage levels established on the labor market are formed as the resultant supply of services to human capital on the part of workers and the demand for them from enterprises. Thus, they unite a multitude of factors that manifest themselves both at the micro level (workers' abilities, their professional qualifications, motivation, intensity of labor efforts, etc.) and at the macro level (the technological state of the economy, the peculiarities of the institutional environment, etc.).

At the beginning of the 21st century, the human capital theory was developed, expanded and supplemented by such scientists as Le (2002), Shishkov (2002), Stiglitz (2004), Chulanova (2008), Armstrong (2011), Kapelyushnikov (2012), Kassaeva and Bondarskaya (2014), Sen (2016), Mayo (2016), Gonin (2017), and Houghton (2017). Exploring various aspects of human capital formation, scientists discovered that there could not be a complete analogy between physical and human capital. Certain scientists understand development have an important role eco-innovation, which means new products, new technologies and new ways of organizing production (Dnishev, Alzhanova, & Alibekova, 2015; Kireyeva, Abilkayir, & Tsoy, 2018). It was also recognized that the amount of income should be calculated taking into account the expected rates of economic growth, according to which the person's salary will, over a certain period of time, be higher than his salary at the present time. The main obstacle for using this method is the absence of statistics on the wages of workers with different personal characteristics that would allow calculating the indicator of lifetime earnings.

It is worth noting that today there are quite a lot of approaches to assessing human capital, but not all of them are practically applicable or are subject to adaptation.

3. Methodology

Speaking about the assessment of human capital, it is necessary to understand that the unit of human capital is not the employee himself, but his knowledge, skills and experience. Another thing is that this capital outside its carrier – the person, does not exist. This is the fundamental difference between human capital and physical capital (machines and equipment).

Human capital, which is a complex economic category, has qualitative and quantitative parameters. Quantitative can be presented and calculated by category (average life expectancy, the proportion of the able-bodied population, the share of specialists with higher and secondary education, etc.) and the value (wage level, etc.) expression. The qualitative aspect is characterized by the level of education, qualification, professional skills, competence and productivity of employees in demand on the modern labor market. At the same time, the evaluation of the quality of human capital can be carried out on the basis of a quantitative measurements of the new qualitative changes achieved, since the majority of factors of its formation and development can be measured by quantitative indicators.

Due to the close interconnection of the elements that make up human capital, the evaluation of human capital must be carried out on the basis of a three-level approach: the accumulated knowledge and level of education of the individual, the human capital of the workers of the individual enterprise and the human capital of the country as a whole, that is, research should be carried out on an individual, microeconomic and macroeconomic levels.

In our study (Chulanova & Ussenova, 2015) an attempt was made to calculate the cost of human capital at the *individual level*. Based on the analysis of the main factors in the growth of human capital, we concluded that the increase in its value cannot be considered in isolation from the formation of a system of quality education, the improvement of the sphere of employment and decent wages. Using the average values of the annual labor income of workers and the level of employment in the whole country, having accepted the probability of survival of an individual (at working age) and constant value, we obtain the following formula:

$$H = \left[(nx I)xR + \left[\frac{(1+g)^n}{(1+e)} \right] \right]$$

where

H is human capital of the individual of a certain category "education earnings";

I is annual labor income of the worker of the category "education earnings";

R is employment rate of a certain category "education earnings";
g is average growth rate of the real income; e is education level;
n is time period.

The proposed methodology can be used to calculate the value of human capital for an individual, and larger, including by age groups of the population.

The value of human capital at the *micro level* is the cost of the enterprise's expenses for restoring the human capital of the enterprise. They include advanced training of workers already employed, medical examination; payment of sick-list sick leave; labor protection costs; voluntary medical insurance, paid by the firm; payment of medical and other social services for a company employee; charitable assistance to social institutions, etc. The development of methodology and improvement of the practice of assessing human intellectual capital at the micro level is aimed at enabling each worker to realize his intellectual potential and innovation attractiveness, which is influenced by many individual factors measured by appropriate indicatory (Kireyeva et al., 2018).

The most well-known method to assess human capital at the *macro level* is the aggregated Human Development Index (HDI). It is calculated annually by the United Nations Development Program for countries and regions of the world, using analytical studies of international experts, statistical data provided by national and international organizations and institutions. The HDI, first developed in 1990, characterizes the development of the country on the basis of measuring three basic parameters of the state of human resources: longevity and health, access to education and a decent standard of living, calculated on the basis of life expectancy at birth, the average number of years spent on education, expected duration of studies, and gross national income per capita (US \$ PPP). The modern method of calculating the HDI bases on the average geometric normalized indices, reflecting the achievements in each dimension.

To convert indicators into indices with a scale from 0 to 1, the minimum and maximum values (or targets) are set. The maximum values are assigned to the actually observed highest values, the minimum values can be conceived as the minimum acceptable values. The following minimum values are established: for life expectancy at birth - 20 years, for both variables in education - 0 years and for gross national income (GNI) per capita - \$100 (Klugman, Rodríguez, & Choi, 2011). The values of the sub-indices are calculated as follows:

$$Xi = \frac{x - \min(X)}{\max(X) - \min(X)}$$

HDI is the geometric mean of the three indices mentioned:

$$HDI = \sqrt[3]{LEI \times EI \times II}$$

where

LEI is Life expectancy Index;

EI is Education Index;

II is Income Index.

The UNDP Human Development Report, in raising human development issues, has placed the wealth of human life above the wealth of the economy.

4. Results and Discussion

When assessing the human capital of an enterprise (micro level), both profit and cost approaches are used, each of which makes it possible to estimate certain cost factors. However, it should be noted that in the current conditions of the formation of the knowledge economy, which presents new requirements to human capital, both methods are not entirely correct, since, among other things, they do not take into account the qualitative parameters of human capital, which is the main productive factor in the development of science, education, health, and the creation of new technologies. The labor potential of an enterprise is the maximum size of the possible participation of workers in production, taking into account their psychological characteristics, the level of professional knowledge and accumulated experience.

Accordingly, in addition to these approaches, it is advisable to use an expert method that allows us to assess the qualitative component of human capital. Evaluation of qualitative indicators, such as the ability of workers to think outside the box, use skills and experience, we suggest to implement in three stages:

At the first stage, it is necessary to identify the key indicators that determine the employee's contribution to the knowledge capital of the enterprise. At this stage, the directions of activity and the contribution of an individual employee in the corresponding direction are determined. For this purpose, the ranking from more to less significant of professionally important qualities of the employee, applicable in one or another direction of the enterprise. The contribution is determined on the basis of the "assessment of the professional maturity of the employee", according to which the employee is awarded a certain score in the framework of the above mentioned directions, and by

ranking the evaluation indicators of professionally important qualities in the following areas:

- Successful performance of functional duties;
- Knowledge of computer technologies;
- Knowledge of foreign languages;
- Contribution to the increase of the company's income;
- Contribution to the development of relations with customers;
- Contribution to the development of international relations;
- Contribution to the development of new scientific directions for scientific organization, etc.

Also important personal qualities of the worker are ranked:

- Ability to develop and implement original solutions;
- Ability to create a normal psychological climate in the team;
- Ability to quickly assess the situation and make optimal decisions;
- Striving for professional growth and continuous professional development;
- Discipline and organization;
- Initiative;
- Ability to achieve agreement on decisions and actions of people;
- Ability to be enthusiastic and to be interested about the work;
- Communication skills;
- Ability to show interest in related specialties.

The second stage is the establishment of weight shares (significance factor) for each indicator, based on how often each indicator is manifested in the certified worker. For greater objectivity of this technique, it is expedient to use weight coefficients (significance coefficients).

According to the enumerated indicators of qualities, the corresponding rank of the attested person (from 1 to 10) is determined. This is the first evaluation of the attested person.

The third stage is the definition of a scoring scale for the evaluation of each indicator with further analysis of the results obtained and an average score for each employee.

Having calculated the weighted average score for each of the proposed professional qualities, it is necessary to summarize all the scores obtained for all qualities, thus determining the final score of the employee's assessment. Different professions and positions may have their own evaluation criteria. Obtaining reasonable estimates of individual and cumulative human capital serves as a necessary scientific basis for determining the optimal level of remuneration for workers when concluding employment contracts. The use of this method will make it possible to optimally use employees in accordance with their abilities; carrying out activities to improve skills, improve corporate culture, etc.

To calculate the economic efficiency of investment of funds in human capital at *the macro level*, it is necessary to take into account the vital indicators that characterize the socio-economic situation in the country. It should be noted that the Human Development Report is widely used for many years in many countries to assess and compare the level of development, assess bottlenecks and develop development strategies to bridge the gap.

However, in our opinion, it should be taken into account that over the past 28 years of the existence of the HDI, significant qualitative changes have taken place in the world. Today, in almost all branches of the economy and in everyday life, an increasingly advanced level of knowledge of digital technologies and the "skills of the 21st century" is required. This raises the need for the transition of the economy to a new stage of development, in particular digitalization, to supplement the calculation of the Index with such indicators as computer literacy of the population and possession of digital technologies. The index of knowledge of computer literacy can be calculated by analogy with the calculation of indices of Life expectancy, Education and Income (Table 1).

Table 1: Targets for calculating the Human Development Index

Indicators	Observed maximum	Country	Minimum
Life expectancy at birth	84,2	Hong Kong	20,0
Expected years of schooling	20,4	Australia	0
Mean years of schooling	13,4	Switzerland	0
GNI per capita	129916	Qatar	100
Internet Users	98.1	Luxembourg	1.9

Using data on Internet Users, an indicator for which figures are available for many countries, we calculated the HDI of Kazakhstan as follow:

$$\text{HDI} = \sqrt[4]{0,870 \times 0,503 \times 0,478 \times 0,75} = \mathbf{0,89}$$

Data for calculation are presented in Table 2.

Table 2: Indicators for HDI calculation for Kazakhstan.

Indicators	Value
Life expectancy at birth	69,6
Expected years of schooling	11,7
Mean years of schooling	15,0
GNI per capita	22093
Internet users	74,1

The use of new sub-index will make it possible, when selecting appropriate criteria, to evaluate human capital, for

example, by age groups. In this regard, it would be appropriate to open courses for older people, to gaining computer literacy skills that would help them continue their work, which will also have a positive impact on reducing the unemployment of people of this age group. Actively participating in the process of social modernization as the bearers of knowledge and experience, this category of workers fulfills the mission of the custodians of the most important spiritual and moral values, ensuring the connection of generations, which is especially important in the light of the spiritual revival of society.

It is obvious that each level of analysis of the state of human capital includes indicators that somehow characterize the education system. Today, the training in the mastery of digital competencies is increasingly included in the standard training programs for working specialties, involving work on machines with numerical control. Also, digital technologies bring changes to approaches to the study of humanitarian disciplines, oriented toward understanding the social structure using certain communicative competencies. All this prioritizes the activation of training of specialists in the field of digital technologies, not only technical specialties, but also communicative ones, as well as other areas. This, in turn, will require the introduction of relevant competencies in educational standards.

5. Conclusions

Human capital as accumulated knowledge and education is of great value. It is the legacy and wealth of a person's personality and of an enterprise (corporation) and country, as well as of society as a whole. Various methodological approaches to the study of human capital have led to unequal definitions of the concept of its essence, which is reflected in the characterization of only certain aspects. At the heart of many definitions, human capital is viewed as a part, a kind of capital in the form of costs, revenues and profits.

Between estimates of human capital, obtained through different approaches, there are huge discrepancies, so it is hardly possible to obtain a unified, objective methodology for assessing human capital. In this case, the expert method (the method of qualitative assessment) of all existing approaches to assessing human capital most objectively assesses the qualitative components of a person. The professionalism of the employee is assessed not only in terms of how well he performs the current tasks, but also how he is able to think creatively and generate new innovative ideas. Comparison of qualitative and quantitative assessments, taking into account the specifics of the

company's activities and the position of the employee, will allow the creation of directions for the further development of employees.

Successful implementation of national programs and breakthrough projects requires the activation of the human factor and the new quality of human capital. In the conditions of industrial-innovative development and digitalization of the economy, education, professionalism and intellect acquire priority (Kireyeva et al., 2018).

Evaluation of human capital at the microlevel, or corporate level, should be an important part in the management of human resources and corporate management. Enhancing the quality of human capital in the enterprise is also promoted by the development of the cultural and organizational diversity of the relationships in the team, which, ultimately, reduces to the development of various spheres of managerial activity in the enterprise as a whole. In this case, not only the organizational sphere is considered, but also the sphere of elimination of racial, ethnic, national, cultural and gender differences. As a result, the task of the enterprise in this case is the search for preservation of such human capital. This will be presented in the form of talented people, possessing not only necessary and important knowledge, but capable of adapting the acquired knowledge for the rational activity of the organization. Such employees are necessary for creation, maintenance and development of the considered enterprise. By investing in their training, the company creates a business foundation for the future, reduces the risks of loss of new opportunities and, as a result, lost profits.

In recent years, the assessment of human capital at the macroeconomic level has become of great economic importance. The category human capital, considered in this article indicates the need for the state to create optimal conditions for return on investment in people. At the same time, investments in people determine the need to improve the state mechanisms that allow more efficient use of modern social and economic resources of society and human resources.

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