

Lecture Notes in Networks and Systems 304

Svetlana Igorevna Ashmarina
Valentina Vyacheslavovna Mantulenko *Editors*

Digital Technologies in the New Socio-Economic Reality

 Springer

Lecture Notes in Networks and Systems

Volume 304

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Editors

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ISSN 2367-3370

ISSN 2367-3389 (electronic)

Lecture Notes in Networks and Systems

ISBN 978-3-030-83174-5

ISBN 978-3-030-83175-2 (eBook)

<https://doi.org/10.1007/978-3-030-83175-2>

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Assessment of the Human Capital Value in the Digital Transformation Context



O. Yu. Kogut

Abstract The effective work of any organization is based on the availability and use of human capital. The significance of this factor is increasing every day, and the impact is not only on the activities of the organization, but also on its value. We have analyzed and generalized existing works in which this topic is considered in order to identify theoretical and methodological developments, the use of which will be possible within the framework of our research. The work structured the costs of human capital formation, considered the main methods for assessing the value of human capital, considering various approaches to determining its essence. Using the cost approach, the types of costs for human capital are considered, their economic essence is investigated. For the first time, a complex mathematical model has been proposed that allows calculating the cost of human capital.

Keywords Cultural capital · Education capital · Health capital · Human capital (HC) · Value

1 Introduction

Many scientists and researchers consider human capital to be the most valuable resource of a post-industrial society and strategically more important than the availability of natural resources, which are exhaustible [1–10]. Currently, human capital is a factor in the successful functioning of any organization and economy in the context of the digital transformation of the socio-economic sphere. All over the world, human capital largely determines scientific and technological progress, the competitiveness of the economy and the rate of economic development of the country. The transformation of the role of human capital, its transformation from a cost factor into the main factor of production and social development, has led to the formation of a new paradigm for the development of countries and the world community. There is a large set of methods that science and practice have created, but these methods differ from

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each other both in the level of human capital research and in the approach used; there are also methods within each of the approaches that are aimed at one of the aspects of assessing human capital.

2 Methodology

In the process of studying the problem of assessing the value of human capital, fundamental works of the classics of economic and philosophical thought, monographs, scientific works, articles of domestic and foreign scientists on this topic were studied [1–3, 7, 8]. The methodological basis for writing an article is a systemic and integrated approaches, a set of methods and methods of scientific knowledge: analysis, synthesis, analogy, induction, deduction and generalization.

A systematic and integrated approach to assessing the value of human capital means that the activities of individual organizations should be studied as part of a system of a higher hierarchical level, considering internal and external relations. At the same time, the object should be assessed not only from the point of view of achieving its local goals, but also necessarily from the point of view of how these goals correspond to the goals of the system of a higher hierarchical level and the interests of society.

3 Literature Review

The study of issues related to the problems of human capital, were engaged: Western scientists Petty [11], Thurow [9], Smith [12], Schultz [13], Becker [1], Kogut [5], Kendrick [14], Fitzenz [2], Flamholtz [3]; Russian economists Tuguskina [15], Tsarev, Evstratov [16], Alaverdyan [17], Arabian [18], Chigoryaev, Skopintseva, Ulyashchenko [19], etc. In its modern form, the theory of human capital was formed in the late 50–60 s. XX century the role of the “discoverer” of this theory in its modern form belongs to the American scientist-economist Schultz, winner of the Nobel Prize in Economics in 1979. Schultz proposed the following definition: “All human resources and abilities are either innate or purchased. Valuable qualities acquired by a person, which can be enhanced by appropriate investments, we call human capital” [13, p. 78].

Professors Dobrynin, Dyatlov and Tsyrenova believe that human capital is not just a set of skills, knowledge, abilities that a person possesses [20]. First, it is the acquired stock of skills, knowledge and skills. Secondly, it is a set of skills, knowledge, skills that is rationally applied by a person in a sphere of social activity and leads to an increase in labor productivity and production. Thirdly, the rational use of this stock, subject to the organization of high-performance activities, naturally leads to an increase in the employee’s income. And, fourthly, the growth of income motivates and motivates a person through investments that can be used to maintain

health, education, etc., to increase, accumulate a new stock of knowledge, skills and motivation to use them effectively in the future.

The problem of assessing the value of HC is of interest due to the complexity and universality of this category, as well as its importance for ensuring the efficiency of the economy. There is no consensus among the authors on the methodology for assessing the value of HC at the micro level.

4 Results

Today in the world economy, modern trends show a change in the role of man, which is not only the goal of social production, but also a resource for socio-economic progress. Scientists-economists interpret the concept of HC in different ways. But they agree that human capital is the main driving force of society, not only the person himself, but also the state should pay close attention to the formation of HC. In the above definitions, human capital acts as the goal of economic development and as the main production resource, without which any purposeful activity is generally impossible.

Taking into account the above, we have formulated the following definition: human capital is a set of knowledge, skills and abilities of a person created as a result of investment in a person and accumulated by a person himself, the effective use of which determines labor productivity and can become sources of income for a person, family, organization and society as a whole. In other words, human capital is a form of capital and a measure of a person's embodied ability to generate income, which is clearly estimated.

Human capital cannot be owned by the organization, and the means of production are the property of the organization. We can see the embodiment of HC in the personality of its owner, and its peculiarity is that it is inseparable from the person himself. Human capital cannot be purchased and sold, it can only be rented out by concluding an employment contract. For the period of work, the employer buys the right to use the employee's labor, and not the labor itself, which the employee continues to own.

There are several similarities between human and physical capital. For example, both generate income for the owner, both are essential components of economic growth. Physical capital is depreciated, i.e. its owner has a guarantee of the reproduction of the invested funds and an incentive to invest. Human capital is not. Depending on the main constituent elements, human capital can be considered as a set of certain elements shown in Table 1.

The analysis made it possible to generalize the main methods for assessing the value of the organization's human capital [1, 3].

1. Calculation method based on the use of direct personnel costs. This method includes accumulation of all personnel costs, including salaries, taxes, health and safety, training and continuing education costs.

Table 1 The composition of HC and its key elements

Human capital composition	Key elements
The capital of education is a system of human knowledge and skills acquired in the learning process	Learnability, intelligence, creativity, skill level
Health capital is a system of physical and psychological health that predetermines the ability to work	Physical strength, efficiency, ability to work, immunity to diseases
The capital of culture is a system of cultural values and behavioral models embodied in social interaction of people	Traditions, image, business reputation, moral and ethical qualities

Source Author based on [19]

2. The method of determining the initial and replacement costs of personnel. The organization's initial personnel costs consist of the costs of finding, recruiting and initial training of employees.
3. The method of competitive assessment of the value of human capital—is characterized by the fact that this method creates the most favorable conditions for its employees, in contrast to a competing organization.
4. The method of the prospective value of human capital. This method assumes considering the dynamics of the value of human capital in the future for 3, 5, 10 and 25 years, not forgetting to assess the competitiveness.
5. The method of measuring the individual value of an employee. The value of the employee forms the future value—if the employee will stay with the organization indefinitely. This cost will include two elements: the upcoming notional cost and the likelihood of the employee continuing to work in the organization.
6. A method for assessing the value of HC, produced based on tests in a business environment. The application of this assessment method can be obtained in two ways:
 - using the actual data that the employee received based on the profit he earned for the organization, or the growth of the organization's assets, including intellectual assets;
 - assessing human capital based on the structure of business doctrines in economics, management, marketing using the latest information technologies.
7. Financial method. This method characterizes the value of human capital, defined as the difference between the total market value of a company and the value of its assets (tangible and intangible). The financial method cannot provide the most accurate assessment of the value of the organization's human capital, since the calculations are not yet based on a single generally accepted methodology, but cost values are used.
8. Comparative method. With this method, an indirect assessment of the value of HC is made by comparing the indicators of competitors with the results of the

organization’s activities. This method has some drawbacks: firstly, in the calculations, we will not get an accurate quantitative assessment of human resources, because it is very difficult to single out the influence of human capital itself in the overall impact on the competitiveness of human capital organization. Secondly, we believe this method is not entirely correct, since almost all organizations use human capital.

This study uses a cost-based approach based on determining the costs that are needed to reproduce or replace the subject of assessment, considering depreciation. In this case, the amount of costs for creating an object is taken as a measure of value. As a result, in order to calculate the human capital cost of an individual employee, and then of all employees of an organization, it is necessary to calculate individual elements. To use this approach, all costs that form human capital must be divided into 3 groups.

Human capital:

- education costs;
- health costs;
- expenditures on culture [17].

For the survival, development and prosperity of society, education is necessary, which, as a social institution, serves the needs of society [21]. In order to meet the challenges of an unpredictable and rapidly changing globalized world, an employee must not only be excellent, resilient and comprehensive, but also must constantly develop and improve himself. This evolution must take place consistently, systematically and on a large scale; therefore, teachers in schools, professors in colleges, administrators, researchers and policymakers are expected to innovate the theory and practice of teaching and learning. To ensure that all students are well prepared for life and work, it must be embedded in all aspects of this complex organization [20].

Taking into account the costs of obtaining primary, secondary and higher education, training in vocational schools and in advanced training courses, it is possible to fairly objectively assess the capital of an employee’s education (taking into account the growth of the invested amount of money over time—compounding):

$$C_e = \left\{ \sum_t C_{pe,t}[P_t(1 + r_t)] + \sum_t C_{se,t}[P_t(1 + r_t)] + \sum_t C_{he,t}[P_t(1 + r_t)] + \sum_t C_{p,t}[P_t(1 + r_t)] \right\} \times [(A_{ret} - A_{act}) / (A_{ret} - A_{beg})] \times TR$$

where: $C_{pe,t}$ —the cost of receiving primary education in the t-th year;
 $C_{se,t}$ —the cost of obtaining secondary general or vocational education in the t-th year;
 $C_{he,t}$ —is the cost of obtaining higher education in the t-th year;
 $C_{p,t}$ —expenses for professional development in the t-th year;
 r_t —is the rate of increase in the t-th year;

A_{ret} —the age at which the employee retires;
 A_{act} —the actual age of the employee;
 A_{beg} —the age at which the employee's labor activity begins;
 TR —test results ($TR = 0-1$).

The refinancing rate of the National Bank of the Republic of Kazakhstan is taken as r_t .

The development of any modern society depends on the qualitative characteristics of its human capital; the capital of health plays an important role here. The health of each person and public health in general is an important element of the state's potential. Health is a complex and multidimensional category that requires the use of interdisciplinary research methods. Health capital refers to investments in a person made with the aim of forming, maintaining and improving his health and performance, for example, the costs associated with health protection (conducting preventive examinations of employees, health insurance and other measures to prevent diseases). Health expenditures are the aggregate of public, private and external costs, as well as out-of-pocket welfare and health care costs. Employee health capital is defined as the sum of the following components:

$$C_h = \left\{ \sum_t C_{gov.t} [P_t(1 + r_t)] + \sum_t C_{leg.t} [P_t(1 + r_t)] + \sum_t C_{ind.t} [P_t(1 + r_t)] \right\} \\ \times [(A_{ret} - A_{act}) / (A_{ret} - A_{beg})] \times TR$$

where: $C_{gov.t}$ —government spending on health in the t-th year;
 $C_{leg.t}$ —costs of legal entities for health in the t-th year;
 $C_{ind.t}$ —expenditures of individuals on health in the t-th year.

The sphere of culture plays a major role in the formation of human capital in the knowledge economy, and this is due to the following circumstances. The use by a person of his cultural potential in the process of social activity does not mean that he is used as human capital. To allow a person to become a subject of labor and occupy a professional niche that corresponds to his cultural level, such a transformation must be carried out only as a result of social action. And, in order to gain access to additional income in excess of the costs necessary for the simple reproduction of the employee and his family, and to obtain not only social, but also professional status.

Various authors agree that cultural capital has a synergistic effect. The development of society, the creation of an intellectual foundation stimulates a synergistic effect. In turn, the intellectual basis guarantees an increase in the quality (standard) of life of the population and a steady increase in the economic growth of the state. Cultural capital includes the costs of culture, art, sports, tourism:

$$C_c = \left\{ \sum_t C_{col.t} [P_t(1 + r_t)] + \sum_t C_{phc.t} [P_t(1 + r_t)] + \sum_t C_{ins.t} [P_t(1 + r_t)] \right\} \\ \times [(A_{ret} - A_{act}) / (A_{ret} - A_{beg})] \times TR$$

where: $C_{col,t}$ —costs of education in schools and colleges of culture and art in the t-th year;

$C_{phc,t}$ —costs for physical culture, sports and tourism in the t-th year;

$C_{ins,t}$ —expenses for visiting cultural institutions (libraries, theaters, museums, etc.), art and sports in the t-th year.

Hence, the human capital of an employee of the organization will be equal to [18]:

$$\begin{aligned}
 HC = & \left\{ \sum_t C_{pe,t}[P_t(1+r_t)] + \sum_t C_{se,t}[P_t(1+r_t)] + \sum_t C_{he,t}[P_t(1+r_t)] \right. \\
 & + \sum_t C_{p,t}[P_t(1+r_t)] + \sum_t C_{gov,t}[P_t(1+r_t)] + \sum_t C_{leg,t}[P_t(1+r_t)] \\
 & \left. + \sum_t C_{ind,t}[P_t(1+r_t)] + \sum_t C_{col,t}[P_t(1+r_t)] \right\} \\
 & \times [(A_{ret} - A_{act})]/[(A_{ret} - A_{beg})] \times TR
 \end{aligned}$$

5 Conclusion

In modern economics, the term “human capital” is used to describe the abilities and skills of people that affect their performance. Thus, we can conclude that the productive and inseparable from the individual abilities are considered as capital. Many works are devoted to the study of human capital and methods of its assessment, but despite this, in practice, there are many unresolved problems in determining the value of HC. Some indicators of HC cannot be measured, for example, there is no way to measure the quantity or value of human capabilities and this is the main problem. At any level of research (macroeconomic, regional, corporate) it is very difficult to collect, process and assess the reliability of the required information, in addition to the fact that the calculation of values is itself a very laborious and complex process. To assess the value of the HC of an organization, it is necessary to use a methodology based on cost accounting.

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