

Strategic Directions for the Formation of the Quality of Human Capital of Education Workers Based on the Construction of a Dynamic Rating Model

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Abstract. Modern economic conditions are characterized by an increasing influence of human capital on economic development, which is accompanied by an increase in the intellectual capacity of production, labor complexity and, consequently, an increase in the requirements for the quality of human capital of specialists in all sectors of the economy. Social educational institutions form an interconnected system, the quality of functioning of which is determined by the compliance of the quality requirements for all components of human capital of workers in this field, and the effectiveness of activity determines the effectiveness of the development of society as a whole.

The presence of changes in the educational space and modernization relating to the education system and professional requirements for workers in the field of general and vocational education; methodology for constructing a rating of teachers has been developed, the main purpose of which is to assess the quality of the human capital of teachers, based on the dynamic nature of the weight coefficients of the integral indicator, which provides the basis for overcoming information asymmetry; priority areas of state regulation of improving the quality of human capital of workers in general and professional education are identified.

1. Introduction

Any economic formation has specific requirements for the quality of workers. Post-industrial society is not an exception, which is characterized by the dominance of high-tech industries that place high demands on the quality of human capital of workers who have the ability to provide high-quality technological and innovative services based on developed competition in all spheres and economic activities. The main requirements at the present time are imposed on workers of the system of professional education. This is due to the fact that, firstly, the rate of updating knowledge has accelerated, and secondly, the cost of education has increased both as a whole per subject and in the total volume.

The study of strategic directions for changing the requirements for the quality of human capital of workers in the sphere of general and professional education will make it possible to determine more deeply the structural changes in the Russian society and solve the aggravated social problems more successfully.

The degree of study of the problem remains insufficient to substantiate the holistic concept of the requirements for the quality of human capital of workers of this professional field, the institutional

conditions of their activities are not fully examined, including a high degree of uncertainty in the assessment, information asymmetry and the existing time lag between the current activity and the final results obtained in its process.

The high theoretical and practical significance of analyzing the dynamics of the quality of human capital of workers in general and professional education and the lack of an adequate system of requirements and guidelines for assessing this quality, taking into account the strategic aspects of the features of both post-industrial society and the needs of economic modernization, identified the research objectives.

The main objectives of the study:

1) to propose a methodological approach to assessing the quality of human capital from the position of the degree of adequacy of financial and resource support for this area and the prospects for ensuring the specified rates of economic growth;

2) to determine the priority directions of state regulation to improve the quality of human capital of workers in general and professional education.

The scientific significance of the study is to develop a methodology for assessing the dynamics of changes in the quality of human capital in education, developing tools for managing the quality of human capital in order to ensure adequate financing of this sphere, taking into account the long-term prospects for creating conditions for innovative economic growth.

The theoretical basis for assessing the quality of human capital in general and professional education in the post-industrial economy lies in the theories of human capital and the post-industrial economy, the formation of which coincides in time, both of them originated in the 70s of the 19th century, as well as in the works of scientists working in the field of education quality assessment.

The methodological basis and main directions of development of the theory of human capital are associated with the names of scientists G. Becker, W. Bowen, E. Denison, F. Liszt, J. Mac-Kulokh, T. Malthus, J. S. Mill, J. Mintzer, V. Roscher, J. Seya, J. T. T. Schulz, Walsh, L. Turou, and many others. They estimated the value of human capital in monetary terms and put it into practice, recognizing the importance of accumulating and improving human abilities.

Among the Russian authors who studied human capital and its impact on the economic growth and development of the country, it is possible to mention A.N. Dobrynin, S.A. Dyatlov, I.V. Ilyinsky, M.S. Klimov, V.N. Kostyuk, M.M. Kritskiy, Y.A. Korchagin, S.A. Kurgansky, T.G. Myasoedova, L.G. Simkina, V.T. Smirnova, E.D. Tsyryonov and others. Their works are characterized by a clearer distinction between the nature, content, types, conditions of formation and accumulation of human capital.

The founder of the theory of post-industrial society is the American economist Daniel Bell. The works of both foreign (D. Andriessen, A. Brian, A. Brooking, John Galbraith, M. Castells, B.Z. Milner, R. Tissen, A. Toffler, L. Edvinsson, etc.), and Russian (L. Abalkina, Y. Amosov, V. Kolesov, V. Inozemtsev, etc.) economists are of considerable importance for the development of this theory. Their work laid the foundations of knowledge about the new paradigm of the economic development of social relations, where the knowledge of workers and their quality are of great importance.

The key problems associated with assessing the quality of Russian education are reviewed in the works of G. Bordovsky, O. Boev, V. Vasilyev, T. Klitchko, T. Kukhtevich, E. Smirnova, B.C. Sobolev, S.A. Stepanov, Y. Trapitsyn, V. Kharchev and others, in which the problem of assessing the quality of modern education is considered from the point of view of identifying factors contributing to the improvement of the quality of the learning process.

However, despite the fundamental nature of the above studies, some elements of the quality of education in the post-industrial economy have not been sufficiently studied. In particular, it is necessary to study in more detail some issues related to the formation of requirements for the quality of the human capital of workers in general and professional education and its objective assessment.

2. Materials and methods of research

The dominant role in the quality of human capital is assigned to the education system, in which it is formed and accumulated both as an individual and society as a whole.

Taking into account the specifics of educational activities, its goals and objectives, the quality of the human capital of workers in general and vocational education can be defined as the degree of compliance of the totality of its components with the requirements, allowing to implement a targeted process of education and training carried out in the interests of the individual, family, society and the state human capital that meets the needs and interests of economic entities.

Table 1. The system of requirements for the quality of human capital of staff in general and professional education.

Components of human capital quality	Quality requirements for human capital components	Evaluation criterion	Qualitative and quantitative characteristics of the human capital component
Health	High level of performance	Age; Morbidity level; Maintaining the health of students	Health status of teachers and students
Morality	High level of morality and morals of a worker of the education sphere	Moral values; Appearance; Attitude to bad habits	Components of human capital quality
Creativity	High level of creativity and creative skills, the use of modern learning technologies	Application of modern education forms; Organization of cognitive activity of students	Creativity of the teacher and presence of their creative skills
Activity and organization	Presence of categories, degrees and titles, author's teaching methods, scientific works	Participation in competitions and Olympiads; Categories of degrees and titles; Intensity of publications	Organizational skills, published scientific works, defended candidate and doctoral theses, implemented author's methods in the learning process
Education	Higher education corresponding to the taught disciplines, timely completion of advanced training courses	Level of education and qualifications, frequency of training courses	Education and qualifications, number of years worked after the last advanced training courses
Professionalism	Presence of teaching experience and high level of knowledge in the taught discipline	Experience; Pedagogical skills; Knowledge of the subject	Experience, skills, educational activities, progress of students

The main requirements for the basic components, reflecting the quality of human capital of workers in general and general and professional education, are a high level of efficiency, education, and morality, the development of copyright techniques, writing scientific papers, the ability to organize interaction with students and their activities, as well as pedagogical experience and knowledge in the field of discipline. Their analysis and features of the development of the post-industrial economy

allows us to form a system of these requirements, including the requirements for each component, its content, the criterion for evaluation and the qualitative and quantitative characteristics of the components of human capital (Table 1).

Requirements for the quality of the human capital of workers in general and professional education are made by "stakeholders", i.e. those who expect to receive economic benefits from its implementation in the future. They are represented by two groups: "recipients", these are students, whose human capital is formed, and investors (students, their families or households, firms and the state), i.e. those entities that pay for its formation and accumulation. The entire set of requirements from "stakeholders" can be classified according to three criteria: they can be divided into formal and informal according to the degree of formality; according to the degree of their generalization to the general and specific, and depending on the entities that make demands on the demands from the "recipients" and from the investors (table 2).

Table 2. The classification of the components of human capital.

Criterion for classification	Types of requirements	Components of human capital
A sign of formality	Formal	Education Professionalism Health of the teacher
	Informal	Health of students Morality Creativity Activity and organization
Degree of generality	General	Professionalism Education Activity and organization
	Specific: general education professional education	Morality Health Creativity
According to the subjects making requirements to quality of human capital of workers in general and professional education	Requirements made by "recipients" of human capital	Creativity Activity and organization
	Demands of made by investors of human capital	Health Morality
	Requirements made by "stakeholders" as human capital	Education Professionalism

The efficiency of educational service market, like any other, depends on the quality of the information generated on it. The main problem of the market of educational service is the presence of information asymmetry in assessing the quality of human capital of teachers. It is a special case of incomplete information, so it is necessary to identify the criteria by which incomplete information becomes asymmetric. These criteria include:

- the presence of disproportion in the distribution of information, i.e. teachers know more "stakeholders" about the quality of their human capital;
- the staff of educational institutions is aware of their information advantage, i.e. they accurately assess the quality of their human capital;

- education workers can take advantage of this information advantage in order to obtain additional benefits, i.e. to characterize their human capital as qualitative and, for example, to receive additional remuneration;

- as a result of the manipulation of their advantage, teachers receive additional benefits, and "stakeholders" incur additional losses, which leads to moral damage and adverse selection, which has a negative impact on public welfare.

The situation with the assessment of the quality of human capital of workers in the sphere of general and professional education on the part of "stakeholders" is characterized by the following: almost all components that allow characterizing its quality are documented. This information is available to a narrow circle of people. Teachers have enough information and knowledge to assess the quality of their human capital and their colleagues and are aware of this. So the first and second criteria of absolute asymmetry of information are fulfilled. However, it is impossible for teachers to deliberately distort information about the quality of their human capital and receive additional benefits. Thus, the third and fourth criteria for the absolute asymmetry of information are not satisfied. Therefore, in the assessment of the quality of human capital of workers in the sphere of general and professional education from the "stakeholders" there is a problem of conditional information asymmetry.

The peculiarity of the market of educational services is that the state here, on the one hand, acts as an "interested person" (investor), and on the other hand, it expresses the interests of society, forming a social order for education, and guarantees its quality to the population. It is here that there is a situation of abuse of information about the quality of their human capital on the part of workers of educational institutions and the possibility of obtaining through this additional benefit, i.e. all the criteria of information asymmetry are fulfilled. Therefore, in relation to the assessment of the quality of human capital of workers in the field of general and professional education from the state as a guarantor of its quality, there is a problem of absolute information asymmetry.

In order for the state to guarantee the high quality of educational services, it must have an effective methodology that makes it possible to evaluate it and, if necessary, develop state measures for its improvement.

As a model for determining the quality of human capital of workers in the field of general and professional education, a methodology for constructing a rating of teachers, the main purpose of which is to assess the quality of human capital of teachers, based on the dynamic nature of the weight coefficients of the integral indicator, which provides the basis for overcoming information asymmetry.

The construction of the rating is determined by the need to differentiate teachers on the quality of human capital and to improve it for those who have a low level. It should be taken into consideration that when creating a rating model, there is no goal that all groups of subjects interested in obtaining quality education can benefit from the result of the rating. The formation of the model is more a method by which public authorities decide on additional funding for those teachers whose quality of human capital does not fully meet the requirements formed at the present stage of development.

The main elements of the model for constructing a rating of the quality of human capital of workers in the sphere of general and professional education are presented in table 3.

Due to the fact that it is impossible to establish unambiguously objective criteria for assessing the component "morality", in the study it is deliberately excluded from the quality rating of the human capital of workers in the field of general and professional education.

The pedagogical staff of general and professional education spheres is chosen as an object for the ranking: schools, vocational schools, colleges and universities, the quality of which human capital is assessed. The subject is the components that characterize the quality of human capital of workers in the field of general and professional education: education, professionalism, health, creativity, activity and organization, morality.

The construction of a human capital quality rating for workers of general and professional education includes five stages.

Table 3. The main elements of the model for constructing a rating of the quality of human capital of workers in the field of general and professional education.

Elements	Content
Purpose	Assessment of the quality of human capital of employees in the field of workers in the field of general and professional education to develop measures aimed at improving it and ensuring compliance with the requirements of "stakeholders"
Tasks	to evaluate the activities of education workers in six components that characterize the quality of their human capital, which will rank teachers and educational institutions according to the specified parameters to form a database reflecting the state of the quality of human capital of workers in the field of education to develop a tool to assess the quality of human capital of workers of educational institutions
Object	Teaching staff in the field of general and professional education: schools, professional technical schools, colleges and universities, the quality of human capital which is evaluated
Subject	Components characterizing the quality of human capital of education workers, satisfying the requirements of all "stakeholders" in the high quality of human capital (education; professionalism; health; creativity; activity and organization)

The first stage consists in determining the criteria and sub-criteria, as well as their scoring values, allowing to assess the quality of the human capital of education workers (Table 4).

Table 4. Criteria and their point values of the indicators reflecting quality of the human capital of workers of education sphere [compiled by the authors].

Indicators	Content of indicators	of	Characteristics of indicators	Points	Source of information
1	2	3		4	5
Criterion A – "Education"					
A1	Level of education	of	- higher pedagogical education (qualification of teacher or lecturer); - higher non-pedagogical education - secondary pedagogical education	3 1 2	Document on education
A2	Advanced training		- in the current academic year; - one year ago; - two years ago; - three years ago; - more than 3 years ago	5 4 3 2 1	Documents confirming the completion of training courses
A3	Training direction		- training direction corresponds to the taught disciplines; - has the right to teach the subjects in which he/she does the training (for schools) - training direction does not correspond to the taught disciplines	3 2 1	Document on education
Total according to the criterion "Education" (max 11 points)					
Criterion B – "Professionalism"					

B1	Experience	- from 5 to 20 years	3	Employment record
		- up to 5 years	2	
		- for more than 20 years	1	
B2	Pedagogical skills	- 4-5 points;	3	Student performance registers
		- 3-4 points;	2	
		- 2-3 points	1	
B3	Level of knowledge on the subject	- participation in subject examinations and final attestations;	3	Orders of administration and teaching materials
		- participation in subject examinations or final attestations;	2	
		- do not participate in subject examinations and final certifications	1	
Total according to the criterion of "Professionalism" (max 9 points)				
Criterion B – "Health"				
B1	Age	- up to 35	2	Date of birth
		- over 35	1	
B2	"Soreness" of the teacher	- low	4	Sheet of accounting of working time
		- optimal	3	
		- permissible	2	
1	2	3	4	5
		- high	1	Portfolio
B3	Maintaining the health of students	- high	4	
		- optimal	3	
		- permissible	2	
		- unacceptable	1	
Total according to the criterion of "Health" (max 10 points)				
Criterion Г – "Creativity"				
Г1	Application of interactive forms of education	- high	4	Work program on the subject
		- optimal	3	
		- permissible	2	
		- unacceptable	1	
Г2	Organization of creative educational activities	- high	4	Work program on the subject
		- optimal	3	
		- permissible	2	
		- unacceptable	1	
Total according to the criterion "Creativity" (max 8 points)				
Criterion Д – "Activity and organization"				
Д1	Participation and prizes in Olympiads and competitions	- prize-winning places are engaged in all competitions and contests in which the teacher and their students took part, but not less than 2	5	Certificates, protocols, awards and membership
		- prizes are taken at least in one of the competitions or contests in which the teacher or their students took part (number of participants must be at least 2)	4	
		- in any of the competitions or contests prizes are not taken;	3	
		- participated in only one competition or Olympiad and won a prize;	2	
		- participated in only one contest or the		

			Olympics, but prize-winning places were not occupied	1	
Д2 (for school)	Presence of the category		- higher category;	4	Certificates and diplomas
			- former category;	3	
			- second category;	2	
			- no categories	1	
Д2*	Presence of degree and title		- Professor, Doctor of Sciences;	5	Certificates and diplomas
			- Doctor of Sciences, does not have the title of Professor;	4	
		1	- Associate Professor, Candidate of Sciences;	3	
		2	- Candidate of Sciences, does not have the title of Docent;	2	
Д3**	Intensity of publications		- no degree, no title	1	Portfolio
			- high publication activity;	4	
			- average publication activity;	3	
			- acceptable publication activity;	2	
			- low publication activity	1	
Total according to the criterion of "Activity and organization" (max 10 points for schools); (max 11 for primary and professional education) and (max 15 points for Universities)					
* Only for professional educational institutions					
** For universities only					

The second step is to obtain estimates for each indicator reflecting the quality of human capital.

At the next stage, the value of each component characterizing the quality of the human capital of an individual teacher is calculated and their weight value is determined (table 5).

Table 5. Determination of weight coefficients of quality components of human capital of workers of the sphere of general and professional education [compiled by the authors]

	A	Б	В	Г	Д	Sum of values on the line	Normalization of the result (Weight Ratio)
A (a)	(1) a1 (A/A)	a2 (A/Б)	a3 (A/В)	a4 (A/Г)	a5 (A/Д)	$E1 = \sum_{i=1}^5 a_i$	$X1 = \frac{E1}{\sum_{i=1}^5 E_i}$
Б (б)	б1 (Б/A)	(1) б2 (Б/Б)	б3 (Б/В)	б4 (Б/Г)	б5 (Б/Д)	$E2 = \sum_{i=1}^5 б_i$	$X2 = \frac{E2}{\sum_{i=1}^5 E_i}$
В (в)	в1 (В/A)	в2 (В/Б)	(1) в3 (В/В)	в4 (В/Г)	в5 (В/Д)	$E3 = \sum_{i=1}^5 в_i$	$X3 = \frac{E3}{\sum_{i=1}^5 E_i}$
Г (г)	г1 (Г/A)	г2 (Г/Б)	г3 (Г/В)	(1) г4 (Г/Г)	г5 (Г/Д)	$E4 = \sum_{i=1}^5 г_i$	$X4 = \frac{E4}{\sum_{i=1}^5 E_i}$
Д (д)	д1 (Д/A)	д2 (Д/Б)	д3 (Д/В)	д4 (Д/Г)	(1) д5 (Д/Д)	$E5 = \sum_{i=1}^5 д_i$	$X5 = \frac{E5}{\sum_{i=1}^5 E_i}$

At the fourth stage, the integral indicator of the quality of the teacher's human capital is calculated (table 6).

Table 6. Methods of assessing the quality of human capital of workers in the field of general and professional education [compiled by the authors].

Indicator	Method of calculation
1	2
Total quality indicator of separate component of human capital within an educational institution (Pi)	$P_i = \frac{Y_1 + Y_2 + Y_3 + \dots + Y_{n_i} - 1 + \frac{Y_{n_i}}{2}}{n_i - 1}$ <p>where n_i – is the number of indicators of i component; $Y_1, Y_2, Y_3 \dots Y_{n_i}$ – calculated indicator determined by the formula: $Y_i = (\Pi_j + 1) / (\Pi_{jmax} - 1)$, where Π_j – is the value of j of indicator I of the human capital quality component; Π_{jmax} – respectively the minimum and the maximum value j of indicator i of the component of human capital quality</p>
Determination of weight coefficients of components of quality of the human capital of workers of the sphere of general and professional education	Table 5
Determination of aggregated expert opinion in assessing the weight of each component of human capital (Xcp)	$X_{cpi} = \frac{\sum_{i=1}^{12} X_i}{12}$ <p>where X_{cpi} – is the average value of weighting coefficient of i indicator; X_i – weight value of the i indicator, according to the expert; 12 – number of experts</p>
1	2
Integral value of human capital quality for each teacher (KЧK)	$KЧK = X_{cp1}P_1 + X_{cp2}P_2 + X_{cp3}P_3 + X_{cp4}P_4 + X_{cp5}P_5$ <p>where P_{1-5} – is aggregate indicator of the quality of the corresponding component of human capital; X_{1-5} – weighting factor of the corresponding component of human capital quality</p>
Generalized indicator of the quality of human capital in the whole educational institution (KЧKed)	$KЧK = \frac{\sum_{i=1}^n KЧK}{n}$ <p>where n – is the number of teachers in a given educational institution</p>

At the final stage, a rating table of the quality of human capital of workers of an educational institution is compiled and generalized indicator characterizing the quality of human capital of its workers is calculated (table 6).

The developed model of the quality rating of human capital of workers in the sphere of general and professional education can be built only on the basis of the measurement results, which are presented in the rating list of the quality of human capital of teachers, taking into account the dynamic nature of weighting coefficients of the integral indicator of the quality of human capital of teachers, which creates prerequisites for overcoming information asymmetry.

The creation of this rating will make it possible to realistically assess the quality of human capital of workers in the field of general and professional education and to take appropriate measures to improve it.

3. Recommendations

Since the right to education is one of the most essential rights enshrined in the Constitution of the Russian Federation, the state acts as a guarantor of its quality. Therefore, the state should take care of the quality of education services, including the quality of human capital of workers in this sphere, as well as raise the level of this indicator if necessary.

The main directions of state regulation of the quality of human capital should include:

- allocation of a separate item in the state budget for spending on improving the quality of human capital of education workers, due to the fact that educational institutions are not commercial organizations and will not be able to earn such an amount on their own due to the social nature of their activities;
- adjustment of legislative acts in terms of specification and regulation of the workload of teachers, their salary and social guarantees:
 - the maximum volume of teaching workload as a wage, and, in general, for one teacher;
 - striking the balance between classroom and extracurricular workload of the teacher within the same wage;
 - establishing reasonable requirements for the ratio of the number of students and teachers;
 - establishment of the official salary for one rate not lower than the average salary in the region, as well as taking into account the basic part and the stimulating part, including the social unit, in the total wage of the pedagogical worker;
- assignment of pedagogical workers engaged in labor activities in state educational institutions to civil servants in terms of establishing for them pension benefits and other social guarantees;
- determination of the amount of monthly monetary compensation for the provision of book publishing products and periodicals necessary for the implementation of educational activities.

4. Conclusions and prospects of development of this research direction

Thus, to overcome the asymmetry of information in assessing the quality of human capital of teachers, it is necessary to adequately and effectively assess it on the basis of building a rating of the quality of human capital of workers in the field of general and professional education. It will make it possible to identify the main problems in the quality of human capital and to develop appropriate measures to improve it. The result will be a full compliance of the quality of human capital of workers in the sphere of general and professional education with the requirements of the "stakeholders".

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