

Human capital and its efficiency in the knowledge economy: the role of continuing education

El capital humano y su eficiencia en la economía del conocimiento: el papel de la educación continua

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ABSTRACT:

In an economy driven by innovations, the trends of the transformation of society as a whole develop at the expense of the complex nature of the process of exchange and use of knowledge both in production and outside it; a significant role is given to the formation, accumulation and effective use of intellectual capital. One of the most important factors determining the formation, development of intellectual capital and its rational use is professional education. In the paper, we have considered such categories as capital, intellectual capital, its essence and classification. Special attention was paid to continuous education as the main factor in the formation of intellectual capital, and the peculiarities of adult workers in terms of education. Our research was based on modern Russian and foreign studies and historical examples of the late 19th century. Calculations are proposed for assessing the effectiveness of education as the most important factor in the formation of intellectual capital.

Highlights: One of the most important factors determining the formation and rational use of intellectual capital is education. The productivity of the work of more educated workers is higher than that of less educated personnel. We have singled out the features of continuing the vocational education

RESUMEN:

En una economía impulsada por las innovaciones, las tendencias de la transformación de la sociedad en su conjunto se desarrollan a expensas de la naturaleza compleja del proceso de intercambio y uso del conocimiento tanto en la producción como fuera de él; Se otorga un papel significativo a la formación, acumulación y uso efectivo del capital intelectual. Uno de los factores más importantes que determinan la formación, el desarrollo del capital intelectual y su uso racional es la educación profesional. En el documento, hemos considerado categorías como el capital, el capital intelectual, su esencia y clasificación. Se prestó especial atención a la educación continua como el factor principal en la formación del capital intelectual y las peculiaridades de los trabajadores adultos en términos de educación. Nuestra investigación se basó en estudios modernos rusos y extranjeros y en ejemplos históricos de finales del siglo XIX. Se proponen cálculos para evaluar la efectividad de la educación como el factor más importante en la formación del capital intelectual. Puntos destacados: Uno de los factores más importantes que determinan la formación y el uso racional del capital intelectual es la educación. La productividad del trabajo de los trabajadores más educados es mayor que la del personal menos

that affect the development of the intellectual potential of an employee with work experience. It is proved that the real material returns from higher education will vary significantly between men and women. So, continuous education is the most important factor influencing the earnings of an employee, his or her attitude to work, labor efficiency, and the level of development of the state economy as well.

Keywords: intellectual capital, professional education, knowledge economy, investment, employment, innovation, wage level and structure.

educado. Hemos destacado las características de continuar la educación vocacional que afectan el desarrollo del potencial intelectual de un empleado con experiencia laboral. Está comprobado que los rendimientos materiales reales de la educación superior variarán significativamente entre hombres y mujeres. Por lo tanto, la educación continua es el factor más importante que influye en las ganancias de un empleado, su actitud hacia el trabajo, la eficiencia laboral y el nivel de desarrollo de la economía estatal también.

Palabras clave: capital intelectual, educación profesional, economía del conocimiento, inversión, empleo, innovación, nivel y estructura salarial.

1. Introduction

"We have good universities not because we are rich but we are rich because we have good universities"

(*B. Clinton, 42nd President of the United States*)

Intellectual capital is the most important component of the productive assets of the organization, functioning in the conditions of post-industrial information society. The following fact indicates the importance of intellectual capital in the activity of modern organization: American supervisors when choosing long-term partners consider that the intellectual capital of the company should be at least 40% in the total capital structure, and only in this case, it is considered that the company is promising. Intellectual capital is a measure of the person's ability to generate income through the use of knowledge, abilities, professional skills, the generation of ideas, the creation of artistic and scientific works. It brings income not only to its owner but to the organization where this person works, to the region, and to the country as a whole. The intellectual capital of the individual can also have global significance, since in the development of science not only intellectual innovations are created, on the basis of which new production technologies and methods of consumption are then formed, but the development as well, transformation of people themselves, and, consequently, the development of the intellectual capacity of the organization and society as a whole take place (Brassey 1872).

In modern conditions, there have been significant changes in the structure of factors that traditionally determine the competitiveness and position of countries in the world market. First of all, this refers to a relative decrease in the value of cheap raw materials and cheap labor and the strengthening of the educational factor. So, back in the 19th century, they came to the conclusion that "the cheapest labor is ... not the most profitable" (Yanzhul et al. 1896), which was confirmed by numerous studies and examples. D.S. Mill, in *The Political Economy*, has stated that "two Middlesex (from the county of Middlesex in England) croppers mow down as much grass as six Russian predial serfs, that is why, despite the high-cost of stores in England and cheapness in Russia, the mowing of hay costs half a penny to the English owner for the same amount, and for the Russian – from 3 to 4 pennies" (Yanzhul et al. 1896, Brooking 1996).

Nowadays, only those who are leading in the markets in such areas as product quality, design, reliability, accessibility can be competitive, and this requires large investments in the development of the occupational skill level of the workforce of economic entities (European Commission 1994). Moreover, in an economy driven by innovation, trends that call for a systematic approach to innovation policy are developing; this policy should not be limited to only high-tech production but should be aimed at transforming society as a whole through the integrated nature of the process of exchanging and using knowledge in production, both inside and outside.

In our opinion, one of the most important factors determining the formation, development of intellectual capital and its rational use is *education, as well as the accumulation and use of knowledge*. One of the main experts in the theory of human capital and the economics of education, T. Schultz has come to the conclusion that "income for education is relatively more attractive than income for human capital" (Schultz 1962). The formation of a new

social and economic order often referred to as a "postindustrial society," is connected, in the opinion of the Japanese researcher Sakaya (Sakaya 1999), with the so-called "knowledge-value revolution", a revolution based on value embodied in knowledge. World educational standards are being gradually transformed under the influence of changes in the properties of information: the contact, authoritarian type of learning is complemented by the remote and interactive one based on the same computer technologies, resulting in the formation of an integral feature of modern education, its continuity, implemented in the model of "education-all-life long".

Continuous vocational education is training aimed at improving the knowledge, skills, and abilities of person in order to improve his or her professional activities. Continuous professional education develops the intellectual potential of an adult worker with work experience, and therefore has the following features:

1. An adult professional student is considered as a voluntary subject of education. The need for education is stimulated by personal and professional needs.
 2. The active role of the learner in planning the nature and methodology of educational programs is urgent.
 3. In the educational process, there is a need for both formal and informal forms of education. For example, lectures-discussions, lectures-consultations, seminars in the mode of "roundtable discussion", individual interviews, etc.
 4. The importance of developing and approving various forms of recognition and encouragement (for example, cumulative assessment of the trainee at the end of the semester taking into account the results of the work during the semester and performing independent work) (Ananichev 2001).
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2. Assessment of the effectiveness of investment in education

The effectiveness of investment in one of the most important components of intellectual capital – in education – depends on the following factors:

1. *The correlation of the cost of training and the market evaluation of intellectual labor*, following the stage of training, will be discussed below. In accordance with the basic models of the theory of human capital, investment in education is appropriate if the stream of future income (R) is not less than the total costs of education (C) (or the rate of return on investment in education is no less than the market interest rate).

$$R = \sum_{t=1}^N \frac{W_1 - W_0}{(1+i_t)^t} = \frac{W_1 - W_0}{i_t} \left[1 - \frac{1}{(1+i_t)^t} \right] \xrightarrow{t \rightarrow \infty} \frac{W_1 - W_0}{i_t},$$

$R \geq C$, where $W_1 > W_0$ which is the increase in wages as a result of the education received; i_t is the market interest rate per year t .

Let us assume that the costs of higher (postgraduate) education are C_1 , and the costs of a lower level (higher education) are C_0 ; $C_1 > C_0$. Then:

a) the condition of the disadvantage of getting a higher education level will be the excess of the cost of training for T_1 years over future incomes:

$$T_1 C_1 > \frac{W_1 - W_0}{i};$$

b) the condition for the profitability of obtaining a lower education level will be the excess of future earnings over the costs of training for T_0 years:

$$T_0 C_0 < \frac{W_1 - W_0}{i}, \text{ and correspondingly:}$$

$$iT_1 C_1 > W_1 - W_0 > iT_0 C_0.$$

This inequality explains the trend in the practice of economically developed countries of higher pay for more educated population. Experts of the highest qualification are expensive specialists, the costs of their training C_1 are higher than the costs for training students preparing for practical work (in the sphere of material production) C_0 (Sakaya 1999). This is because the productivity of work of more educated workers is higher than that of less educated personnel.

According to some estimates, each year of education brings the worker in developed countries at least 10% of the increase in annual income (Grigoryeva 2001). And this trend has existed for more than one century. In the autumn of 1895, P.M. Shestakov conducted a study of the relationship between the literacy of workers and the level of their earnings in the cotton-printing factory of Em. Tsindel. It has turned out that a literate worker gets on average 62.3 kopecks a day; an illiterate worker gets 57 kopecks, that is, less by 9.3%. This is due, firstly, to the fact that literacy positively affects the productivity of workers, and, accordingly, their day-to-day earnings. In addition, according to the results of Shestakov's study, a conclusion was reached on the influence of the age of the worker, or rather, "the number of years worked by workers in the factory" (Yanzhul et al. 1896) on labor productivity and wages (see Table 1).

Table 1
Comparison of the daily earnings of literate and illiterate workers of Em. Tsindel's printing factory (1895) (Yanzhul et al. 1896)

Age	The daily earnings of a worker (in kopecks)		The difference in favor of the literate one (in kopecks)	The difference in favor of the literate one (%)
	literate	illiterate		
15-20	33.5	31.1	+2.4	+8
20-25	51.0	45.6	+5.4	+12

25-30	62.1	48.2	+13.9	+25
30-35	89.7	59.8	+29.9	+50
35-40	88.5	64.3	+23.7	+37
40-45	88.9	69.7	+19.2	+28
45-50	107.5	71.4	+36.1	+51
50-55	85.4	80.1	+5.3	+7
55-60	104.3	73.0	+31.3	+43
60 and more	63.8	88.8	-25.0	-28

The table shows that the literate person receives higher earnings than the illiterate one. The difference in favor of the former ranges from 7 to 51%. The only exception is the age group over 60. Perhaps this was due to the low quality of education of this category of workers. The difference in earnings is due to the excess of the amount of work performed by literate workers compared to the less literate; A. Gorbunov expresses this difference by a number from 20 to 50% (Yanzhul et al. 1896) with much better quality of work and says that with the introduction of an eight-hour labor (three shifts instead of two), in some branches of the Dityatkovskaya paper-making factory where the study was conducted, it was possible to reduce the number of people in the shift from 20 to 50%, whereas in offices with illiterate workers, it was impossible to rightsize without detriment to the work performed. That is, education is important and brings higher income not only to the employee but to the employer as well. Specialists of this century concluded (Klimov 2002, Goskomstat of Russia 2009) that as a result of the intellectualization of labor and a sharp increase in its productivity in industry and agriculture, in about 30 years 2% of the able-bodied population of the Earth could satisfy the needs of the rest of the world's inhabitants. At present, in the industrialized countries, the share of employed does not exceed 10%, while of those directly involved in the material production – 20%.

Moreover, the education of workers affects not only the quantitative performance indicators but also the personal (moral) qualities of workers and their attitude to work, and, accordingly, increases labor productivity (Goskomstat of Russia 2011a). Thus, the studies conducted at the end of the 19th century by the Committee of the 2nd Congress of Russian Figures on Technical and Vocational Education (Yanzhul et al. 1986) have confirmed such facts that remain relevant at the present time as 100 years ago, namely:

- the trainees, in comparison with the uneducated, are distinguished by "great intelligence and sharpness, great observance and dexterity, and, in general, the ability to adapt more readily to different things of work", that is, they adapt more easily to new working conditions, new content of work and changes in a company;
- "without exception ... literate workers ... are suitable for those posts where you require observation, intelligence, and attention";
- the students "notice greater order of work, almost no mistakes occur from some kind of indifferent attitude toward work", "cases of deception and theft among such workers are only as a rare exception, imprinted in the oral chronicles of the factory", that is, the reliability and loyalty of literate workers increases;
- "the desire of the student to lighten his ... labor is noticeable, which he achieves rather quickly, using devices that require ... some ingenuity." This indicates a creative approach to the work of literate workers, their creativity, desire and ability to rationalize and improve the efficiency of labor (Goskomstat of Russia 2011b).

2. *On the size of the excess of income (wages) of a highly educated worker over the income of a less educated worker.* This thesis is based on the fact that differences in wages reflect differences in the productivity of these workers. "Monetary income from education" is revealed as a difference in lifetime earnings of those who have different education (Shchetinin, 2001). The costs of education, in addition to the direct costs of training, also include the so-called lost income. This is the potential earnings that a person could get if he or she worked and did not study. That is, lost earnings measure the value of the student's time spent on the formation of his human capital. The share of lost income, according to experts, usually is more than the share of direct costs of education (Shchetinin 2001). To compare the dependence of earnings on the level of education, we give the following example: thus, in the US, the annual income (Shchetinin et al. 1998) of a highly qualified specialist was 74.6 thousand dollars, income of a doctor of sciences – 54.9 thousand dollars, an employee with a master's degree – 49.4 thousand dollars, a bachelor's degree – 24.4 thousand dollars, a worker with incomplete higher education – 19.7 thousand dollars, a worker graduated from secondary school – 18.7 thousand dollars, without any education – 12.8 thousand dollars.

3. *On the level of external and internal effectiveness.* *Internal efficiency* shows the relationship between the costs of education and its quality. To increase internal efficiency, it is necessary to invest in providing students with educational literature, visual aids, improve the level of teacher training, curricula and the forms of organizing and conducting classes. The money invested in education will not become capital that generates income if a person is unclaimed in the labor market (Edvinsson 2005). As we see from Fig. 2, the lowest unemployment is observed among persons with higher education. To assess the relevance of specialists in the labor market, the criterion of *external efficiency* (Shchetinin et al. 1998) is used. At the same time, a low level of the external effectiveness of education is capable of depreciating the highest indices of internal efficiency, since high indicators of the quality of knowledge can be socially depreciated by the low real demand for this knowledge in a particular society.

Investments in education are important not only for an employee who earns large wages and who enjoys higher demand in the labor market than less educated colleagues but also for the employer since the work of more educated worker is of higher quality and efficiency. Unfortunately, in our country, there is an enormous problem of realizing the strategy of Russia's innovative development. A shortage of personnel still remains; that is, people who are capable of uniting the country's intellectual and technological resources and ensuring the commercialization of innovations in the domestic and global markets (Bykova & Musatova 2002).

3. The current state of the problem of investment in intellectual capital

Comparing investment in education and science in 2010, the US spent \$396 billion, Japan – \$142 billion, China – \$141 billion, Russia – \$22 billion (Fund for Supporting Young Scientists, n.d.) The comparison is not in Russia's favor. From our point of view, investments from the state should be decisive. A significant increase in investment in science and education is required. Only in the development of technology, it is necessary to invest, according to scientists, at least 5% of GDP for 5 years, i.e. by 3.5 times more than at the present moment.

Equally beneficial are private investments in higher education by individuals. These investments, as a rule, are fully paid off and bring tangible benefits. The rate of return on private investment in education (private rate of return of education) for obtaining a bachelor's degree is 11.8 to 13.4% (Dobrynin et al. 1999), for a one-year postgraduate level – 8%, for a master's degree – 7.2%, and for the doctor of philosophy – 6.6%. So, at a competitive examination at one of the most prestigious universities in the world, Harvard, 200 applicants per place, the cost of educating is \$75,000 per year that determines the high earnings of graduates of this university compensating the cost of training. The same parallel can be drawn between the cost of education on an extrabudgetary basis at Moscow

universities, the competition in these universities and the return on the accumulated intellectual capital. As a rule, graduates with higher education receive salary easier, which will allow compensating for education expenses. French researchers Charlot & Malherbet (Charlot & Malherbet 2013) study the link between education and labor. There is also a gender aspect of this problem. A number of Russian scientists (Simonenko A.M., Baskakova M.E.) note that the real economic returns from higher education will vary significantly between men and women. Only pay for education will be the same for men and women, the use of training materials and other direct costs. With regard to indirect costs and direct benefits from higher education, they are formed outside the education sector – in employment, where discrimination based on gender is very clearly expressed. An analysis of the situation that Russian women occupy today in the world of work allows saying that it will be much more difficult for them to "work out" their spending on education.

4. Conclusion

So, continuous education is the most important factor affecting the earnings of an employee, his or her attitude to work, productivity and labor efficiency, and also the level of development of the state economy. "We have good universities not because we are rich but we are rich because we have good universities" – this quite fair thesis used as an epigraph of the paper we would like to apply to the nearest future of Russian companies. And only in this case, in the case of quality continuous education, with adequate investments from the state and business, the economy of the modern state will be able to move to an innovative development path.

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