TRANSFORMATION OF LIFE-LONG EDUCATION AS A FACTOR OF MAINTENANCE OF COMPETITIVENESS OF RUSSIAN ECONOMY

Alzhanat Suleymankadieva
Saint-Petersburg State University of Economics and Engineering, Russian Federation, saljanat@mail.ru

Abstract

The efficiency of Life-Long education System (LLES) is defined as a difference between rates of knowledge increase (gain) in a science and real economy. Rate of knowledge increase in LLES (ΔLLES): a) depends on a gain of knowledge in scientific system; b) defines novelty of created products, services, non-material objects in system of real economy. So, if a gain of new knowledge in system of continuous science (cs) to present as derivative of the knowledge created in scientific sphere (ΔCS), and a gain of knowledge in real economy (as new kinds of products, technologies, services which are used by consumes) as derivative of knowledge of real Economy System (ΔRES). Then, it can be shown as a following inequality: ΔRES \leq ΔLLES \leq ΔCS. In scientific sphere of knowledge are born, in LLES they are broadcasted, transferred to students, and in real economy they are used. The efficiency LLES will be greatest, if \(ΔLLES \approx ΔCS \approx ΔRES\).

Keywords: Life-Long Education, Continuous Knowledge, transformation of Life-Long Education, new forms of Life-Long Education Integration, periodic improvement of professional skills, retraining of organizational personnel during all active professional life.

JEL Classification: M21, M53.

Introduction

Characteristic features of a postindustrial technological way of manufacture are: a humanization of technologies; transition to resource-saving type of reproduction, reduction of loading by natural resources and environment; growth of scientific manufactures; informatization of society on the basis of computerization, interactive multimedia systems and information networks; globalization of scientific and technical progress, prompt distribution of highly effective innovations; miniaturization of techniques.

In the new economic conditions many organizations fail because of following reasons: 1) survival in dynamic and competitive business environment requires innovation; 2) innovation requires new knowledge, or a new way of combining current knowledge; 3) new knowledge, or a new way of combining current knowledge, requires learning (George P. Huber, 2004).

Advancing rates scientific and technical progress in non-productive sphere develops, forming conditions for harmonious development, strengthening of health, improvement of quality of life and disclosing of creative abilities of the person. Rates of distribution of new knowledge and innovations are repeatedly accelerated, efficiency of activity of people in sphere of spiritual reproduction which gets priority value in a postindustrial society raises.

Manufacture of new knowledge, distribution of the scientific information and training of the people capable practically to apply and develop scientific knowledge, represent complete system of closely interconnected elements. This circumstance also gives the objective grounds for development of system of Life-Long Education system (LLES), which provides continuous process of manufacture and fast distribution in it the scientific information, creation of new knowledge and its using as direct productive force.

LLES is an intermediate element in the system: «Science (S) – Life-Long Education system (LLES) – Real economy (RE)». The mathematical description of the law of accelerated development of a science was offered by scientists G. Vleduts, etc. (Добров Г.М., 1989). It starts with the differential equation (1).

\[
dS / dt = kS ,
\]

where \(dS/dt\) – «speed» of science development; \(S\) — scientific results (opening, creation of new scientific ideas and projects); \(k\) – the factor of proportionality inherent in a certain science and concrete conditions of its development. Integration of this equation receives mathematical expression of the movement law of a science (2).

\[
S = S_0 l^k .
\]

In resulted functions \(S_0\) – the sum of results of a science by the time of readout, \(l\) – the basis of natural logarithms (Добров Г.М., 1989). At the period of doubling equal to 15 years, the factor \(k\) accepts value 0.05, and last equation accordingly takes a form (3).
\[ S = S_0 e^{0.05t} \quad \text{(3)} \]

More valuably in our opinion, the method of joint consideration of the statistical data about development of the objects concrete and closely connected among themselves in triad RE – LLE – S («Real economy – Continuous formation – the Science») is represented.

The character of changes in rates of increase in these three systems is various. It is possible to notice that the growth rates in the real economy considerably are lower then the innovative growth rates of Life-Long Education, and the growth rates of Life-Long Education considerably are lower then the growth rates of scientific development.

The aims of this article are: 1) the analysis of the Life-Long Education development level, which is a major in the transferring process of a new knowledge from scientific sphere to the sphere of real economy; 2) revealing of the significant role of knowledge in the transformation process of the Life-Long Education.

The role and estimation of Life-Long Education System in Russia

LLES, being an intermediate link in triad «RE – LLES – S», plays a considerable role in transformation and translations of knowledge from scientific sphere to the area of real economy. Therefore, in the given work we make attempt to carry out the analysis of LLES’s development level.

The analysis of LLES’s development level represents stage-by-stage process and includes two investigation phases with using of expert and analytic economic and statistic methods.

1. The analysis of general (integrated) indicators of LLES’s development level. At the given stage the general (or integrated) indicators, which characterize the stability of LLES (X) and economic safety (Y).

In order to definite the given indicators the statistic method of definition of weighed arithmetic mean is used.

The indicator X is based on definition of summarized of two LLES’s indicators: adaptability (X1) and innovativeness (X2) by the weighed arithmetic mean formula (4).

\[ X = X_1 \nu_1 + X_2 \nu_2 \quad \text{(4)} \]

where \( \nu_1 \) and \( \nu_2 \) – factors of weightiness (importance) of each indicator of adaptability and innovativeness. The sum of factors weightiness is equal in the given approach to 1.0 and value of each of them is accepted equal to 0.5.

The indicator Y is defined with the similar formula using the arithmetic weighed means. It is based on summarizing of two indicators: viability (Y1) and self-sufficiency (Y2) and it is represented (5).

\[ Y = Y_1 \phi_1 + Y_2 \phi_2 \quad \text{(5)} \]

where \( \phi_1 \) and \( \phi_2 \) – factors weightiness (importance) of corresponding LLES’s indicators: viability and self-sufficiency. As well as earlier, the sum of factors of weightiness is equal to 1, and value of each of them – 0.5.

Adaptability indicators, innovativeness, viability and self-sufficiency LLES are estimated on the basis of criteria which depending on the purposes and problems of the researcher can change both on quantitative structure, and under the maintenance, i.e. by a design procedure. The adaptability indicator is estimated by criteria: (a) ability LLES to self-adjustment; (b) ability to self-organizing (a fast regrouping of forces and resources from one direction on another) (Михайлушкин А.И., 1998). The indicator innovativeness of LLES is characterized by following criteria: (a) ability to constant introduction of scientific and technical, organizational-administrative and economic innovations (introduction of new information, computer technologies; equipment updating, introduction of achievements of scientific and technical progress; presence of research laboratories; personnel updating, introduction of achievements of scientific and technical progress; presence of research laboratories; personnel updating, ability to self-training and introduction of new knowledge in LLES; discoveries, etc.); (b) ability to constant updating of programs of training and specialties and specializations (constant updating and perfection of programs of training; opening of new demanded specialties and specializations and closing unpromising and unclaimed, etc.) . The indicator of viability LLES is estimated by criteria: (a) ability to reproduction of personnel resources (quantity of the graduates remaining in an education system, quantity of candidate and doctor's protection of employees of an education system for the certain period of time, presence of internal constantly operating system of improvement of professional skill, etc.); (b) ability to reproduction of library fund (publishing presence in educational system; volume of the methodical literature published for last three years; volume of the bought literature for last three years), etc. (Михайлушкин А.И., 1998). The self-sufficiency indicator is estimated by criteria: (a) ability LLES to self-financing (presence of system of paid training; conducting the commercial activity which connected and has been not connected with educational activity; rendering of paid services, etc.); (b) ability independently to make
organizational and administrative decisions (presence of the financial, personnel, material resources are necessary for acceptance of organizational-administrative decisions, etc.) (Судейманкасова А.Э., 2010). In this work we used an expert estimation method, a 100-mark scale of estimation, to summarize indicators of adaptability, innovativeness, viability and self-sufficiency of LLES.

2. Calculation of the complex indicator, which characterize the level of LLES’s development in the long term (Z). To determine this indicator here were used the indicators, which characterized the strategic conditions of LLES’s development, i.e. indicators X and Y. It is determined by using the statistic method of finding by weighed arithmetic mean by the formula (6).

\[ Z = X\omega_1 + Y\omega_2 \]  

where \( \omega_1 \) and \( \omega_2 \) – factors weightiness of two indicators: stability and economic safety LLES. The sum of factors weightiness is equal to 1.0.

The importance of each indicator is determined basing on expert way according to purposes and research problems. In results of the analysis it is possible to have the following characteristics of LLES’s development in the long term. If \( 0\leq Z <50.0 \) the level of LLES’s development is in the long term characterized as low, if \( 50.0 \leq Z<80.0 \), as average, and if \( 80.0 \leq Z <100.0 \), the level of LLES’s development is estimated as high. Thus, the more level of indicator Z, the more sustainable prospects of LLES’s development. The value \( Z=25.0 \) was received by using the given technique (on hypothetical example of LLES in Russian conditions) and the values of indicators X and Y were accordingly: 30.0 and 20.0 and the importance (\( \omega_1, \omega_2 \)) each of them – 0.5. The results show us that the indicator Z are characterized as a low level of LLES’s development.

Thus, it is possible to notice that low level of LLES’s development is related, in our opinion, first of all, with an absence of close interrelation between scientific sphere and an education system, between educational sphere and system of real economy. All these systems operate separately, instead of together. There is a situation that the educational system is closed for innovations and new ideas, new knowledge. It doesn't produce new knowledge and not only, but also it doesn't collect and doesn't translate them to the system of real economy. In addition, we can assume that the higher developed information and communication technologies, which should be used in the process of transferring new knowledge from the scientific sphere to the real economy are’t used. In our opinion, in the development of LLES the continuous knowledge should be a leading factor. It should define intensity and progressiveness of national economy development. The scientific continue to growth at an accelerating rate. For example, George P. Huber notices that after the first scientific journal appeared in the 1660s, it took just under 100 years for the number to grow to approximately 10. Thereafter the growth increased exponentially: 100 journals by 1800, 1,000 by 1850, perhaps 10,000 by 1900 (George P. Huber, 2004). Therefore it requires from the LLES to translate a new knowledge from the scientific sphere to Real Economy faster and faster. The LLES should be more dynamic.

**Knowledge as a leading factor in developing of LLES**

Studying the knowledge maintenance as economic category, it is necessary to allocate following features (property): (a) step-type behavior of knowledge as product (the concrete knowledge either is created, or isn't present; there can not be a knowledge half or on one third); (b) availability of knowledge (like others public, public, to the blessings, knowledge, being created, are accessible to all without an exception); (c) cumulative character of knowledge; (d) information character of knowledge (knowledge, being an information product after it have consumed, doesn't disappear as it occurs to a usual material product) (Milner B. Z, 2009); double character of knowledge (the knowledge component is present at each product and service). Knowledge is available in the various goods and services, for example, in a fashionable tie (knowledge of a brand), in a drink «Coca-Cola» (a brand and reputation of manufacturing), in consulting services (the saved up knowledge of the previous consultations of similar clients), in restaurant services (knowledge of technologies of preparation of dishes and knowledge of preferences of clients), etc. (Гапоненко А.Д., Орлова Т.М., 2008).

Investigating a role and a place of knowledge in LLES, it is necessary to notice that there is a point of view according to which knowledge is considered as source and the tool applied to expansion of borders of innovations which are a motive power of economic growth, competitiveness, as a whole developments of the new economy which is based on continuous knowledge (Снорепп З., 2007). But key aspect of such development is investments into formation, first of all, but. In our opinion, knowledge in LLES acts not only as a source and-or the tool necessary for transformations in LLES, they are also result of LLES process:
knowledge, participating in process of transformation of LLES, change, generalized, replenish, and consequently, are improved, are more precisely transformed to other, already new knowledge, skills. This process of transformation of knowledge also is to constants in LLES. According to V.Ageev, knowledge is derivatives of LLES process, i.e. its constantly changing abilities (Areev B.B., 2009). On the other hand, analyzing the given thesis, it is possible to notice that the formation continuity is also result of speed of escalating of knowledge, i.e. from cumulative character of process of their replenishment. That is created by the previous generations, we study, we keep and, leaning against them, we go forward. So, great Newton spoke about itself: ‘elf I see further Descartes it because I stand on shoulders of the giant’ (Добров Г.М., 1989).

Considering LLES as an intermediate element in «Continuous Science System (CSS) – Life-Long Education System (LLES) – Real Economy System (RES)», the efficiency of LLES we can define as a difference between rates of knowledge growth in a Science and Real Economy (RE). Rate of knowledge growth in LLES (ΔLLES): a) depends from knowledge growth in the Scientific System; b) defines novelty of created products, services, non-material objects in real economy system. So, if a new knowledge growth in a continuous science system (CSS) to present as a derivative of knowledge which was created in scientific sphere (ΔCSS), and a knowledge growth in Real Economy (as new kinds of products, technologies, services which are used by consumers) to present as derivative of knowledge in Real Economy System (ΔRES), then, it can be shown as a following inequality: ΔRES ≤ΔLLES ≤ΔCSS. In scientific sphere the knowledge is born, in LLES it is broadcasted, transferred to students, and in the Real Economy it is used.

The scientific knowledge can't be stopped or turned back, it continuously moves forward with increasing speed. Therefore rates of scientific knowledge will be more than rates of a gain of knowledge in LLES and even more, than in real economy. The problem consists in approaching speed of changes in three systems to each other (ν1 = ν 2 = ν 3), i.e. it is important to approach rates of a gain of knowledge in LLES and in RE to rates of a gain of scientific knowledge.

Thus, in new conditions of economic development there is a necessity of creation of the concept «creations, transformations and transfers of continuous knowledge» in sphere of real economy. This concept assumes process of constant adaptation, periodic improvement of professional skill and retraining of the personnel during all active labor life both within the limits of formal, and within the limits of an informal education system on the basis of qualitative base preparation (Сулеймакадиева А.Э., 2009). In the given context «manufacture, transformation and transfer of «Continuous Knowledge» is understood as process of continuous training and retraining of organizational personnel during all active professional life, or process of periodic improvement of professional skills. Thus the concept of «Continuous Knowledge» personnel of any organization: (a) is under construction in the line of ascent so that each subsequent step was logic continuation previous and represented the finished cycle of training; (b) is necessary and sufficient for generating of intelligence of all organization. The important factor is not only to what and as the personnel, but also that study, how much effectively it brings the knowledge in the organization, promotes development of its mental potential. Otherwise, knowledge does the organization intellectual, which is able to study in how it is better to be trained.

Investigating a problem of knowledge, it is necessary to give particular attention to revealing of knowledge of two types. First of all, it is the organizational knowledge representing a certain set of principles, the facts, skills, rules which from the information point of view provide decision-making processes, behavior and actions in the organization. But on the other hand, the organizational knowledge develops on the basis of knowledge of the person, each worker in the organizations (Гапоненко А.Л., Орлова Т.М., 2008). D.Stounhaus believes that feature of organizational knowledge consists that it, being an organization active, increases, as a rule, on exponential law when owners share by it (Стунхус Д., 1999). He notices that an exchange of knowledge in the organization increase its property to add cost to the goods more than proportionally.

Manufacture, transformation and transfer of continuous knowledge of the personnel includes following components of their training: (a) the general education (development of natural inclinations and abilities, development of the social experience saved up by a society, the basic social and cultural rules and norms); (b) vocational training (development by the person of professional bases, sights and estimations in the field, comprehension of laws inherent in it), that is the training forming bases of qualification of the expert. The idea of «continuous knowledge» includes two components: on the one hand, process of continuous training, and with another, – personnel vocational training.

Otherwise, training and preparation – two parties of one phenomenon. Training is connected with development of the general intelligence of the personnel, with acquisition of the general knowledge, and preparation – with acquisition of special knowledge, skills and the abilities concerning carried out functions and work.
Mid-annual rate of a gain of new knowledge makes 4-6 %. It means that the expert should receive upon termination of educational institution about 50% of professional knowledge. The volume of time necessary for renewal of professional knowledge for experts with higher education makes 28 % from total amount of time which the worker during all efficient period owns. Life-Long Education becomes the important factor of competitiveness of the expert on a labor market (Богданова И.Ф., 2007). All history of formation and development of person as a independent area of its activity indicate that the learning process should be continuous and adaptive.

Economic efficiency of LLES is defined, first of all, by volume and quality of new knowledge which directly depends on qualification, creative abilities and number of the shots prepared by an education system. But even the greatest ideas and opening play a role of productive force when there is enough of the people, capable to apprehend them and creatively to use in mass production of goods. Therefore system effectiveness of continuous formation is directly proportional to the volume of introduced new knowledge increased by depth of their mastering and width of distribution in a society. In other words, for maintenance of peak competitive in the work of the society it is necessary, that rates of a gain in each of systems were as much as possible the close to each other.

The transformation of Life-Long Education requires the new forms of Life-Long Education integration system. The effectiveness of Education System depends from government policy to the development of human capital. According to C. Dahlman, there are some recommendations: (1) achieving efficiency gains should be the first step in increasing the funds available for the teaching and learning; (2) greater investment in education is needed; (3) the curriculum needs reforming and upgrading at all levels to increase the emphasis on problem solving and practical skills; (4) the quality of education needs to be better gauged. The focus is on inputs to education. The vocational and training system curriculum should put more emphasis on general competencies that promote adaptability and life-long learning. It requires to make effective distance learning system; (5) retraining programs need to tailored to the job opportunities and to the ages and backgrounds of the workers to be retrained (Dahlman J. Carl., 2001); (6) there should be new forms integration of science, education system and real economy, which are based on creation of intellectual and creative bank of knowledge. Consequently, new ways of development of information and communication technologies that accelerate the transferring process of knowledge from the scientific sphere to the real economy based on transforming of Life-Long Education continuing. Only then Russian Real Economy can be competitive in in conditions of contemporary globalization.

The conclusion

The transformation of Life-Long Education requires the new forms of Life-Long Education Integration system. The effectiveness of Education System depends from government policy to the development of human capital. According to C. Dahlman, there are some recommendations: (1) achieving efficiency gains should be the first step in increasing the funds available for the teaching and learning; (2) greater investment in education is needed; (3) the curriculum needs reforming and upgrading at all levels to increase the emphasis on problem solving and practical skills; (4) the quality of education needs to be better gauged. The focus is on inputs to education. The vocational and training system curriculum should put more emphasis on general competencies that promote adaptability and life-long learning. It requires to make effective distance learning system; (5) retraining programs need to tailored to the job opportunities and to the ages and backgrounds of the workers to be retrained (Dahlman J. Carl., 2001); (6) there should be new forms integration of science, education system and real economy, which are based on creation of intellectual and creative bank of knowledge. Consequently, new ways of development of information and communication technologies that accelerate the transferring process of knowledge from the scientific sphere to the real economy based on transforming of Life-Long Education continuing. Only then Russian Real Economy can be competitive in in conditions of contemporary globalization.

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