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DEVELOPMENT OF DIGITAL EDUCATION IN RUSSIA: SOME QUESTIONS STRATEGII[1]

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Abstract

The article discusses the features of the development and implementation of digital technologies in Russian education. The rational creation and implementation of projects for the development of information systems (digitalization) of education can and should be a step towards removing the Russian secondary and higher schools from the protracted crisis, modernizing it in accordance with global trends in the development of the modern economy and society and, accordingly, solving the problems of Russian society and States accumulated to date. The article analyzes the risks and threats associated with these processes. Approaches to the analysis and minimization of the risks of the possible negative impact of digitalization in education are proposed. It is proposed to implement these approaches within the framework of the state project "Designing a Strategic Management System for the Development of Digital Education in the Russian Federation". This will allow preserving the continuity of the positive traditions of Russian education to implement a harmonious implementation of digitalization projects in it, in line with modern development trends.

Keywords: Digitalization, education, strategy, risks, trends.

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1. Introduction

The modern development of science, technology and society as a whole is characterized by trends associated with the formation of the sixth technological order (Sidorov, 2017; Gertsog, Danilova, Korneev, Savchenkov, & Uvarina, 2017), reindustrialization (Afanasyev, 2018; Goridko & Nizhegorodtsev, 2017), the development of NBIC convergence (Khalin & Chernova, 2018; Shmatkov & Pereyaslova, 2013), and the formation of Industry 4.0 (Glazyev, 2018; Schwab, 2019). The most important component of these processes is the further development of information technology and its part, called «digitalization».

For the first time, the term «digitalization» was introduced in 1995 by the American computer scientist Negroponte (2017). However, as noted in studies (Kozyrev, 2017; Lomachenko, Kokodey, Kolbachev, & Pakhomova, 2019; Klyachko & Sinelnikov-Murylev, 2018), the actual processes of digitalization, at least in the economy, have begun long ago. They consisted in the begun replacement of analog technologies for working with information with digital ones. Undoubtedly, the implementation of such transformations in the information sphere, technology, economics and in all other spheres of society is necessary and meets all of the above development trends.

2. Problem Statement

The course announced by the leadership of the Russian Federation on digitalization of the economy and the rest of the life of Russian society gives hope that the measures necessary for digitalizing information flows in various fields will be carried out and will lead to increased stability and production efficiency, and will create favorable conditions for the development of members of society, building up human and social capital in the country. In other words, they will yield useful results in the narrow and broad sense of the term “digitalization” (Klyachko & Sinelnikov-Murylev, 2018).

On the other hand, the excessive prescriptive imposition of digitalization measures (which we are already observing) may run counter to the interests of Russian society and may not, in fact, correspond to modern trends. This will only discredit the very idea of digitalization and will not produce the expected results. In this regard, the probability of «pseudo-digitalization», carried out exclusively for the implementation of directives of higher authorities, is particularly alarming. It is enough to recall a similar situation that took place several years ago after the announcement of nanotechnology as a strategic direction for the development of science and technology in the country, which led to the mass attribution to nanotechnology of numerous developments that are not related to the production and use of products with a given atomic structure by controlled manipulation individual atoms and molecules (Kozyrev, 2017; Kuznetsov, 2018).

One can give an even more ancient and, one might say, «textbook» example. The decision of the January (1955) Plenum of the Central Committee of the CPSU "On increasing the production of livestock products", zealously executed by party and Soviet leaders "on the ground" in terms of expanding corn crops without taking into account the soil-climatic and economic characteristics of the regions, led to a complete discrediting the main idea of this decision and exacerbated the crisis in Soviet agriculture.

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3. Research Questions

Obviously, the greatest threat of «overdoing» in digitalization is in government institutions and in other spheres of life, the most severely regulated by legislation and other regulatory government documents. These areas include education. A consequence of the aforementioned state course on digitalization of Russian society was the development and adoption of the program of the Ministry of Education of the Russian Federation «Digital School» (Colin, 2018), the project «Moscow Electronic School» [1] and a number of other departmental projects in the field of education (Rozina, 2015). In particular, the scientific project 19-010-00377, «Designing a Strategic Management System for the Development of Digital Education of the Russian Federation», currently ongoing, supported by the Russian Foundation for Basic Research, within the framework of which this study is dedicated, is dedicated to this.

4. Purpose of the Study

The purpose of the article is to determine the main directions of strategic development of digital education of the Russian Federation.

5. Research Methods

It is obvious that the rational creation and implementation of projects for the development of information systems (digitalization) of education can and should be a step towards removing the Russian secondary and higher schools from the protracted crisis, its modernization in accordance with the above-described global trends in the development of modern economy and society and, accordingly, to solving problems of Russian society and the state accumulated to date. However, numerous researchers point to the existence of threats and risks directly related to the digitalization of education (Sidorov, 2017; Klyachko & Sinelnikov-Murylev, 2018; Kuznetsov, 2018). A number of other authors also devote their research to the potential threats of digitalization of education for Russian society (Kozyrev, 2017; Colin, 2018; Khalin & Chernova, 2018). Systematization and analysis of these risks were performed in our work (Gertsog et al., 2017). In light of the foregoing, the risks of inadequate implementation of policy documents (the risks of "Khrushchev corn" in digitalization) and the risks of inconsistency with global development trends (the most important of which were listed at the beginning of this article) should be added to these risks. The model of the process of designing a system of strategic management of the development of digital education of the Russian Federation, proposed in (Lomachenko et al., 2019), can contribute to overcoming all these risks. This model provides for several levels of selection of projects (activities) for digitalization of education, the upper (federal) of which is to monitor the proposed projects for possible risks. In our opinion, the composition of risks controlled in this case should include:

a) risks due to the specifics of digitalization of education;

b) the risks of inconsistency with world development trends;

c) the risks of inadequate implementation of policy documents.

Obviously, to analyze digitalization projects for the absence of these risks, special techniques are required. The risk analysis of group "a" can be carried out on the basis of the approach described in (Klyachko & Sinelnikov-Murylev, 2018; Shmatkov & Pereyaslova, 2013), its adaptation to the conditions of education digitalization projects was proposed in (Schwab, 2019). It is advisable to analyze the risks of group "b" on the basis of the methodology for testing innovative projects and other developments to the current global development trends proposed in (Schwab, 2019). The methodological basis for monitoring and evaluating digitalization projects is the provisions of an evolutionary economy, in particular, the theory of technological structures. The provisions of evolutionary economics and the theory of technological structures are used in the Methodology, taking into account the content of directive documents of the Government of the Russian Federation that determine the directions and content of research and development in the field of digitalization. The technique is based on a combination of methods for quantifying the qualitative characteristics of a digitalization project based on their objective indicators and expert judgment.

5.1. Main part

Evaluation of the results of research and development in the field of digitalization is carried out on the basis of the theory of technological structures is to determine the conformity of the results of research and development carried out in the framework of the digitalization project, the characteristics of a particular technological structure. The assignment of research and development results to one or another technological structure is carried out on the basis of the characteristics proposed in the well-known work. Moreover, the degree of materialization of information in the production system provided by their application is used as the evaluated characteristics of the results of research or development; the dimensional scale of the processes of shaping, carried out at the same time and the degree of approximation of processes to the level of extremely effective technologies. The degree of information materialization in production systems, deepening as we move from the previous mode to the next, is estimated on the basis of the concept of technological relations and functions.

6. Findings

As an additional parameter characterizing the degree of progressiveness of the digitalization project, we use an indicator of the concept of managing the socio-economic system that is characteristic of the conditions for applying the results of research or development. Determination of the correspondence of the scientific direction and the direction of technology development to the technological structure is carried out in accordance with the algorithm shown in Fig. 1. The measured characteristics are:

- x1- level of closeness of technology to the maximum permissible;
- x2 - the degree of materialization of information;
- x3 - dimensional scale of the processes of shaping.

Limits of change of parameters: [0,1].

The degree of technology approaching the maximum efficient is estimated by experts as follows: = 0, if the technology level does not correspond to the maximum permissible by more than 50%; x1 = 1 if the technology level corresponds to the maximum permissible; ∈ (0, 1) in all other cases. The degree of information materialization is estimated by experts as follows: = 0, if the degree of information materialization> 5; x2 = 1, if the degree of materialization of information = 2; ∈ (0, 1) in all other cases.

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The dimensional scale of shaping is estimated by experts as follows: = 0, if the dimensional scale of shaping processes is> 100 nm; x3 = 1, if the dimensional scale of shaping processes ≤ 0.1 nm; ∈ (0, 1) in all other cases. The degree of consistency of opinions is determined on the basis of the analysis of variation of estimates. The coefficient of variation is calculated, i = 1,2,3. If the coefficient of variation of estimates is less than 30% for each indicator, then we proceed to the calculation of the integral indicator. The integrated value of assessing the correspondence of the scientific direction and the direction of technology development to the modern technological structure is calculated by the Euclidean distance method taking into account weight coefficients.

$$TU= \sqrt{\sum_{i=1}^{3} \alpha_i (1 - x_i)^2} \quad (1)$$

where α_i – coefficients of significance of factors for which the condition $\sum_{i=1}^{3} \alpha_i$ =1. (at this stage of the methodology, all parameters are considered equal).

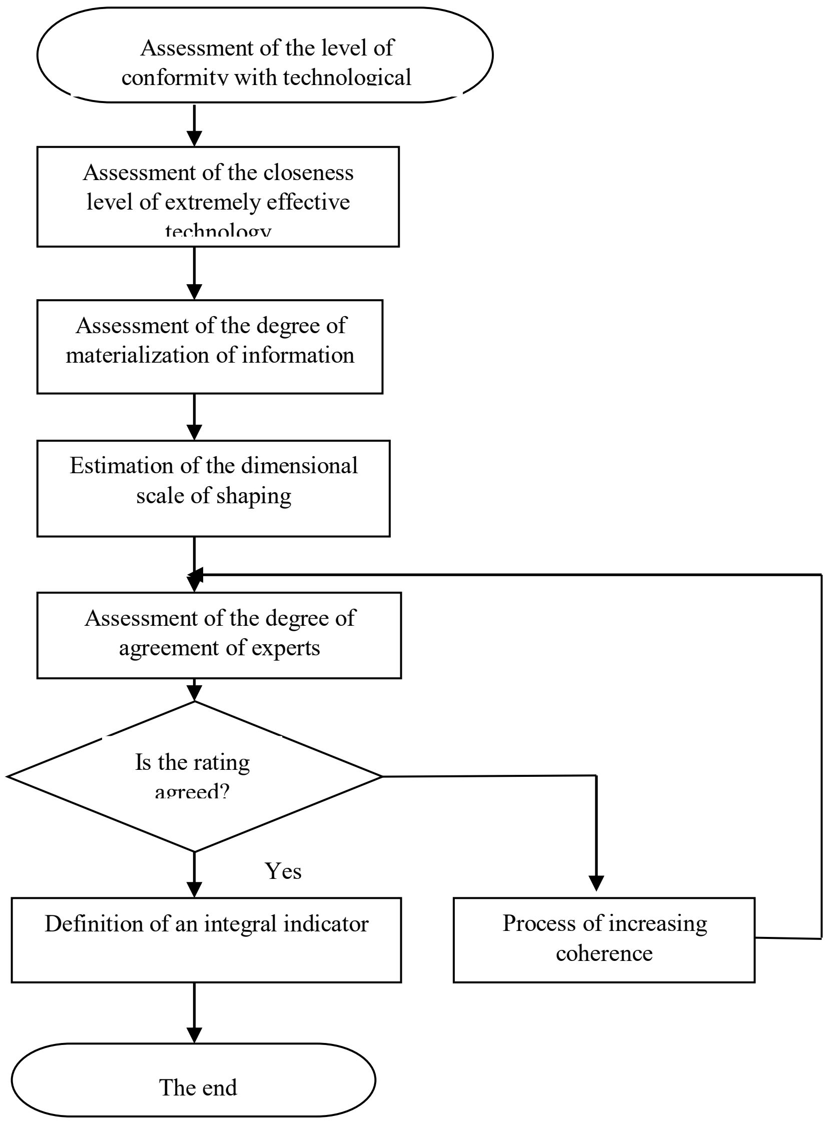

Figure 01. Algorithm for assessing the level of conformity of a digitalization project with technological structure

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A comprehensive indicator of compliance with the technological structure can take values in the interval [0,1]. Depending on its value, the following solutions are possible: - if $0 \leq TU \leq 0{,}3$, then the digitalization project as a whole corresponds to the modern technological structure; - if $TU > 0{,}3$, then the digitalization project does not correspond to the modern technological structure.

Assessment of the compliance of the project with directive documents is carried out on the basis of an expert method. The measured PN characteristic takes the value 0 or 1: PN = 1, if the digitalization project complies with the directive documents, PN = 0, if it does not.

The integrated value of the digitalization project assessment is based on the convolution of the eligibility criteria given above:

$$IP = (\alpha_1 TU + \alpha_2 PN + \alpha_3 CT + \alpha_4 TP + \alpha_5 SR), \tag{2}$$

where α_i- significance factors for which equality holds

$$\sum_{i=1}^{5} \alpha_i = 1 \tag{3}$$

Values α_i determined on the basis of the ranking of the evaluation criteria with the assessment of consistency by the coefficient of concordance:

$$C_{conc} = \frac{12\sum_{k=1}^{n}(\sum_{l=1}^{m} R_{kl} - \overline{R})^2}{n^2(m^3 - m^2)}, \tag{4}$$

where n=8 (number of experts), m= 5 (number of alternatives evaluated), R_{kl}- ranks defined by the l-th expert for the k-th criterion, $\overline{R}$ - average amount of ranks. The result of the assessment is considered consistent if $K_{конк}$ no less 0,4.

The values of weighting factors (indicators of the significance of the criteria) are distributed as follows: {0,33; 0,1; 0,12; 0,2; 0,25}. IP can take values in the interval [0,1].

At the monitoring stage, changes are evaluated and decisions are made to exclude certain digitalization projects from the recommended ones.

To assess the risks of group «B», the development of a special technique is required, which is an independent task.

7. Conclusion

Along with the development of the risk assessment system described above and the selection of digitalization projects, further elaboration of the development of a digital education strategy is necessary, which, in our opinion, should be as follows:

1. Organization of interaction between educational institutions developing content and other components of digital education, coordinating their activities on the basis of co-competition.

2. Preparation of faculty for conducting the educational process in a digital environment while improving their skills in subject areas.

3. Organization of business interaction with higher education, which provides training for specialists in accordance with modern tendencies in the development of Industry 4.0: in-depth study of methods for creating digital doubles, the development of kyierphysical production systems, etc.

4. Formation of the university environment of digital education.

5. The expansion of academic freedoms and student opportunities in terms of choosing a learning path, in particular - providing a choice of student learning opportunities both on the basis of digital platforms and traditional methods.

6. Realization of the concept of lifelong education, taking into account additional opportunities due to digitalization.

This will allow preserving the continuity of the positive traditions of Russian education to implement a harmonious implementation of digitalization projects in it, in line with modern development trends.

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