

Foundations of Designing the System of Strategic Management for Digital Education at the Macro Level

J Gnezdova¹, T Lomachenko², T Kokodey³, M Mikhailov⁴, K Mitus³

¹Smolensk State University

Russia, Smolensk

²Sevastopol Affiliate of Plekhanov Russian University of Economics,
Russia, Sevastopol

³Sevastopol State University, Sevastopol, Russia

⁴Taurida Academy of V.I. Vernadsky Crimean Federal University, Simferopol, Russia

E-mail: Iuliy_67@mail.ru

Abstract. The article describes the design of the system of strategic management of the development of digital education on the basis of the three-level pyramidal concept of formation of the optimal network structure of digital education development strategies. The key questions of creation of conditions for introduction by 2024 of the modern and safe digital educational environment providing formation of value to self-development and self-education at the learning educational organizations of all kinds and levels, by means of process of creation of "road maps" in education are considered.

The "road map" of the educational environment is considered as a system, a set of specially organized pedagogical conditions for personal development, in which the infrastructural, content-methodological and communication-organizational components function on the basis of digital technologies. The formation of a digital educational environment in an educational organization will allow for the modernization of the educational process, the introduction into pedagogical practice of e-learning technologies, models of mixed learning, the automation of educational quality management processes, the formation of students' learning skills in the digital world, the ability to create digital projects for their future profession, the presence in the educational organization on the Internet.

1. Introduction

Transition to advanced digital, intelligent production technologies, creation of systems for processing large amounts of data, machine learning and artificial intelligence requires from the education sector to improve the efficiency of the educational process, taking into account the formation and sustainable development of digital education in the conditions of high fluctuations of markets and the development of situational management tools at the state level (for example, in the environment of distributed situational centers). Designing the system of strategic management of the development of digital education is to solve the problem associated with the definition of theoretical and methodological support for the formation of an optimal strategic management system for the development of digital education in Russia. Creation of a steadily functioning and developing on the principles of self-organization three-level pyramidal concept, in which the first level is the system of distributed smart-centers of digitalization of educational organizations, accumulating information

about the formation and functioning of the information-educational environment, digitalization of the educational process and strategies for its further development. The second level is the system of regional distributed situation centers, which aggregate the information received from the organizations on digitalization of education, formulate regional strategies of development of digital education and portfolios of projects on their implementation, then transfer this information to the level above, where the projected system of strategic management of digital education development at the national level is located. The system uses the information obtained to form the directions (strategies) for the development of digital education in the Russian Federation and the options for their implementation. The result of the system's work is "going down" to the lower level to adjust regional strategies by situation centers, which, in turn, provide feedback to educational institutions. Therefore, this conceptual mechanism makes it possible to form an optimal set of strategies for the development of digital education in the country depending on the formalized patterns (templates) of environmental influences.

We will consider in more detail the theoretical modeling of the second level, namely the system of distributed situational centers, which aggregate the information received from organizations on the digitalization of education, formulate regional strategies for the development of digital education and portfolios of projects for their implementation, and then transfer this information to the projected system of strategic management. This level implies a certain plan of action - the development of a roadmap for the creation of a standard (model) regional situational center for digitalization of education, which includes: a system for monitoring the information and educational environment of educational organizations: educational content (online courses), as well as the means and technologies of its provision, information and reference base, software and hardware, visualization and interactive support of the educational process, staffing; a system of analysis of monitoring results and information about vision, strategies and plans of digitalization from educational institutions; a system of forecasting the development of digitalization of educational institutions using scenario analysis methods; a system of modeling and correction of the consequences of strategic decisions made by organizations regarding the digitalization of the educational process.

"Roadmaps" are a new tool in the practice of social sector management. In the education system, roadmaps appeared as a tool to implement the Presidential Decrees of May 7, 2012, No. 597 and No. 599, as well as changes incorporated in the state program of the Russian Federation "Education Development" for 2013-2020 (GPRO). Road maps continue the logic of the program-targeted management, based on the principles of management by results.

Problems of target-oriented management in the public sector have been repeatedly discussed in the scientific literature [3]. Nevertheless, the analysis of road mapping experience is relevant, because so far there have been no research papers to summarize the experience of road mapping in modern Russia, to identify emerging problems and identify ways to address them.

Improving the quality of education through the development and use of information technologies is the main focus of the State Program of the Russian Federation "Information Society (2011-2020)" (Resolution of the Government of the Russian Federation of April 15, 2014 № 313) [4].

Formation of a roadmap in an educational organization is an urgent necessity, because the university has a special mission, which is to prepare a comprehensively developed graduate with the necessary set of skills and competencies, ready to function in a highly developed information society.

The digital educational environment of an educational organization implies a set of ICT tools, the use of which should have a systematic order and meets the requirements of the Federal State Educational Standards (FSES) to the formation of conditions for the implementation of the basic educational program of higher education, contributes to the achievement of planned personal, metaproject, subject matter learning outcomes by students. In addition, the digital educational environment of an educational organization should become a single communication space for all participants in educational relations, an effective tool for managing the quality of educational programs, the work of the teaching staff [5].

Formation of the digital educational environment of the educational organization will allow to provide modernization of the educational process, to introduce in pedagogical practice technologies of electronic

learning, models of the mixed learning, automates processes of management of quality of education, formation at students of skills of training in the digital world, ability to create digital projects for the future profession, presence in the educational organization in a network the Internet.

2. Methods

The difference between the modern information society and the roadmap in the information-educational environment, which should correspond to this society, is that they are based on the use of information and communication technologies. A new paradigm is needed to achieve the educational outcomes of a 21st century student. It is difficult to overstate the importance of the roadmap in education - its quality largely determines the success of education of students. The main quality indicator is the provision of educational opportunities for all subjects of the educational process. Therefore, the modernization of Russian education informatization is one of its priorities [6].

Such scientists as O.N. Luchko, M.I. Bocharov, E.V. Tanova, O.N. Arefiev were engaged in the problems of using ICT in the management and administration of the educational institution. Amerongen, Stichting Kennisnet, Kurova N.N., problems of using telecommunication networks in training - Bukharkina M.Y., Moiseeva M.V., Polat E.S., Uvarov A.Y., problems of creating and using digital educational resources, electronic textbooks and virtual environments - Grab V.P, Grigoriev S.G., Grinshkun V.V., Lazareva I.A., Osin A.V., Uvarov A.Y., Krasilnikova V.A., Vedeneev P.V., Zavarihin A.S, Kazarina T.N. Zenkina S.V., Prozorova Y.A., Bashmakov M.I., Mashbits E.I., Rakitina E.A., Robert I.V., Kozma R.B.

3. Results and discussion

A fast-developing market for educational services outside the formal education system is emerging, which may in the short term reduce the scope of traditional educational systems, lead to the creation of new educational models that meet the emerging and rapidly changing needs of consumers. A considerable part of innovations in education is already being implemented through educational and technological start-ups, demand for new competencies and forms of training is growing, provoked by the dynamics of economic development and rapid change of technologies. As a result, a new type of learners has emerged, forming their own educational trajectory, aimed at self-education, self-actualization and self-development, combining learning, work and personal development.

Today, the regional education system is faced with the task of building a new type of educational environment - a digital educational environment, which involves all participants in the educational process: the administration of educational organizations, teachers and students, their parents, municipal education authorities and social partners. Therefore, the development of a competent roadmap is designed to expand the possibilities of organizational forms and methods of education, the use of digital services and resources (shifting the paradigms of education to online and hybrid models, the spread of the BYOD approach (the use of students' own mobile devices), the use of cloud technologies), contributing to the greatest effect of the use of information and communication technologies in the educational process. In modern conditions, the road map will form the necessary social, economic and, of course, pedagogical effect, if the created and implemented information technologies will not become a foreign element in the traditional system of professional education, but will be naturally integrated [7].

The digital system can lead to a single denominator of all stakeholders in the advanced educational environment. In turn, such coordination is guaranteed to ensure economic growth and development of the state. It means that the interest in roadmap development is dictated by time and state necessity. In the process of development, several stages can be identified (Table 1)

Table 1. Stages of formation of the road map of the educational organization [8].

Stages	Explanation
Stage I. Organizational stage	<ol style="list-style-type: none"> 1. Conformity of the existing material and technical base with the requirements of the Federal State Standard. 2. Planning of replenishment of material and technical base. 3. Planning the training of the school staff. 4. Analysis of ICT level - competence of teachers. 5. Development of local acts. 6. Choice of software most suitable for the given conditions.
Stage II. Formation stage	<ol style="list-style-type: none"> 1. Creation of methodical and technical support service. 2. Formation of material and technical base. 3. Training of staff. 4. Formation of a single information space.
Stage III. Analytical stage	<ol style="list-style-type: none"> 1. Assessment of compliance with the established requirements of the Federal State Standards. 2. Introduction of changes.

A number of key aspects should be taken into account in the development of a digital educational environment in an educational institution (Figure 1)

- The level of ICT competence of teachers in an educational organization;
- Possibilities of introducing information and communication technologies in the practice of teaching all subjects of study;
- Possibilities of implementing information and communication technologies in the activities of the educational service of an educational organization;
- Educational institution and support services;
- Availability of the educational organization with the necessary equipment;
- conditions for practical application of computer equipment and other digital tools by all participants in educational relations;
- Possibility of open access to information channels of the local internal network, Internet global network and media centers;
- Continuous development of the technical infrastructure of the digital educational environment.

At implementation of the road map appropriate programs of realization are formed:

I. « Development of distance learning of students »

realization term 2019-2022.

Purpose: creation of conditions for realization of electronic and of distance forms of education.

As a result of the implementation: an information resource of the departmental distance learning system was created, a public library of distance learning courses was formed, author's training courses were developed, electronic collections of teachers' methodological developments on the use of distance learning technologies and e-learning in educational activities were published, annually raising the level of ICT competencies of teachers in the region.

II. «Creation of the telecommunication infrastructure of the education system»

realization term 2019-2022.

Purpose: Introduction of a departmental videoconference system.

As a result of the implementation of the project, the efficiency of management activities will increase, the number of teachers who have improved their qualifications in the field of ICT will rise, and the number of participants in regional and municipal educational events (students, teachers, managers) will also increase.

III. «Creation of a regional segment of the contingent of trainees by individual trajectory»

realization term from 2025 to 2030.

Purpose: use of modern information technologies to improve the quality of services in electronic form in the educational sphere.

As a result of the project implementation, information systems used by educational institutions are integrated with the unified state information system "Contingent-Region"; a united database of educational institutions, educational programs and training plans of educational institutions has been formed; education services are brought to the Unified Portal of Public Services.

Indicator: "digitalization" of education, as well as those responsible for the methodological basis for the implementation of the digital educational environment.

4. Scientific activities

Blockchain technology - each newly discovered effect affects several areas. The new block of knowledge, organized into a global scientific knowledge base, is capable of generating far more insight than the part of science where it was computed and proven. This forms a "snowball" effect - in fact, blockchain technology creates the preconditions for the most efficient operation of the artificial intelligence algorithm. The most promising is to combine the scientific knowledge base with that of specialists, professors, students and students.

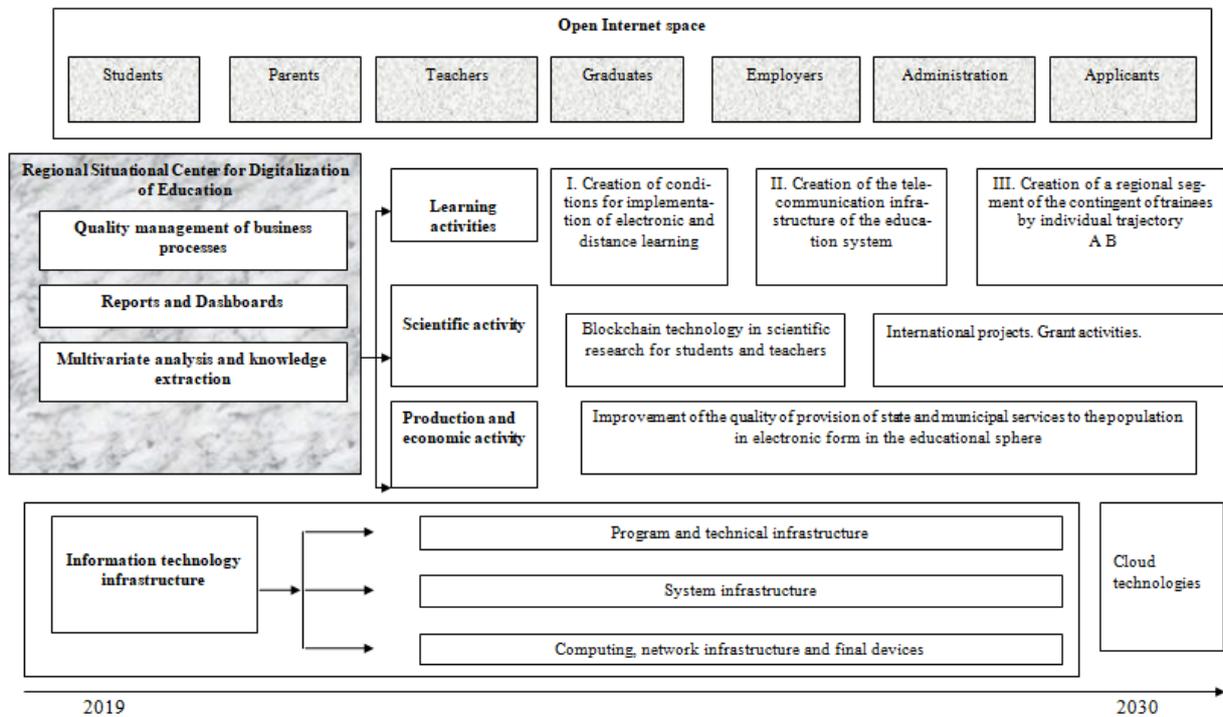


Figure 1. Digital roadmap of the educational organization.

In modern conditions, the objects of monitoring in the educational process are its results, the personal characteristics of all participants in the educational process, their needs and attitude to the educational institution.

Building an effective environment is key to effective digital education. The environment must meet the objectives of the digital society - create conditions for a wide choice of educational inquiry, for its flexible correction in the formation of an individual educational trajectory as necessary. The environment should offer a variety of tools [7]:

1. for self-study and / or with the help of a mentor,
2. for prompt and friendly feedback,
3. for broad interpersonal cooperation without age barriers.

Building such an environment is impossible in the logic of rigid standards and centralized restrictions. The dynamics of modern society requires open competition. For open competition, simple contour rules are needed for the inclusion of new educational products and services in the digital environment and the exit from it of old ones. Restrictions should be minimal and only in those situations without which risks are too high.

The key tool for shaping the environment as an open ecosystem is the standards for data exchange protocols between various information systems in its composition. The flexibility and openness of modern digital technologies should ensure that each student can create his own environment to support an individual educational trajectory — conveniently combining the capabilities of different educational institutions, rather than forcing them to switch between them.

4. Conclusion

Roadmap - an action plan for the integrated functioning of key components of a modern and secure digital educational environment in order to ensure high quality and accessibility of education of all types and levels. The current transformation of IT infrastructures, increasing the penetration of the Internet and the rapid spread of mobile devices cause the emergence of an increasing number of new educational applications and innovative learning technologies.

Developed and implemented IT solutions are focused on supporting more creative and innovative teaching methods, as well as on a more explicit return on investment. Technologies can reduce costs in the education system - in particular, it is focused on initiatives to create electronic textbooks, the development of distance learning, and the use of open data [8].

In modern conditions, the objects of monitoring are the educational process itself and its results, the personal characteristics of all participants in the educational process, their needs and attitude to the educational institution. Information collected during the monitoring should provide the educator or supervisor with the necessary and sufficient data to select an adequate training or management model.

For monitoring it is recommended to use a set of methods. This provides a holistic view of the state of the educational system. The main indicators of the monitoring of the educational program today include:

1. effective management of the educational organization using modern digital tools, modern financing mechanisms;
2. information and library centers with working areas equipped with reading rooms and book storages, ensuring the safety of the book fund, media library;
3. placement of products of cognitive, educational, research and project activities of students in the information and educational environment of an educational institution;
4. design and organization of individual and group activities, the organization of their time using ICT;
5. planning of the educational process, recording its implementation as a whole and individual stages (speeches, discussions, experiments);
6. ensuring access in the school library to information resources of the Internet, educational and fiction literature, collections of media resources on electronic media, to multiplying technology for replicating educational and methodical text-graphic and audio-video materials, results of creative, research and design activities of students ;
7. planning of the educational process, fixing its dynamics, intermediate and final results.

Thus, the global movement of education systems to the openness of data and content reflects the growing trend of more efficient use of very different information. This addresses the issue of not only reducing the cost of access to traditional resources, but also the problem of the lack of educational resources (and even teachers) in some regions. In a number of countries, such open initiatives are actively supported by the authorities and are considered strategic.

5. Acknowledgments

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