

Paradigm Transformation of Education System in Digital Reality*

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Abstract. The modern higher education system lags far behind the requirements of the labor market and demands of consumers of educational services. This has been especially evident recently when digital tools have penetrated widely into all areas of human activity. A significant reduction in the time lag of the technological digital wave prevented representatives of several generations of knowledge holders from adapting to the demands of digital reality consumers. The COVID-19 pandemic was a catalyst that, in a shortened period, transferred the education process into an online environment. All the restrictions that supporters of the traditional model considered an obstacle to the digitalization of education in an instant became unsustainable. The authors of the article prove that the future of education lies in the formation of a hybrid educational environment that permeates the entire vertical and horizontal of the individual trajectory of development of a human of the future.

Keywords: Digitalization, Education, COVID-19, Interactive Technologies, Humanization, Educational Depository, Mentality, Teachers, Students, Hybrid Educational Environment.

1 Introduction

The rapid transformation of all areas of life occurring in the information society, increasing diversification of work, reduction of the life cycle of technologies demands the fastest readjustment of the whole paradigm of a traditional way of life including, first of all, changes in the mentality of people of generations X and Y. Today, it is these

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generations namely that are the most significant participants of the introduction of innovations.

However, the paradox of the situation is that representatives of generation X are not ready for digital reality, and representatives of generation Y - for the necessary speed of digitalization. On the contrary, generation Z, which is now widely present in the market of consumers of educational services and has just entered the labor market, are ardent supporters and confident users of digital tools. The COVID-19 pandemic has become a natural catalyst to synchronize the demands of the digital economy and the mentality of different generations. The experience of adapting to the new reality is exemplified by distance learning implementation at Astrakhan State University

The introduction of distance education in universities has transferred the competition between them to a higher, global level also [1]. The authors of the article aim to present arguments in favor of creating a hybrid educational environment that implies an organic combination of traditional and digital education that meets the demands of modern times and levels out the fears of representatives of generations X and Y not to find their place in the digital reality. The objectives of the research are to review current developments in the field of e-learning, to analyze statistical material on the successful application of e-learning, carried out before and during the COVID-19 pandemic, to argue for the creation of a free single national online educational depository, humanization of the education system, which involves increasing access to the higher education system for those who do not have sufficient financial resources

The author of the definition of “digitalization” is K. Schwab, who predicted the digital revolution to be accompanied by the Internet, miniature devices, and the development of artificial intelligence. According to A. Kechelava, digital reality forms a hybrid world through which with the use of the virtual world the vital actions of the real world are performed [2]. However, these founders of the digital transformation of society did not pay much attention in their works to the transformation of the education system. A. Marey views digitalization as a paradigm shift in communication and interaction with each other and society. In the works of E. Vartanova and M. Makseenko, much attention is paid to the complex solution of infrastructural adjustment and transformation of managerial, behavioral, and cultural character [3-4].

L. Kapranova emphasizes that the most important feature of a digital person is the skills to apply them in professional life [5]. N. Bitiutskaya noted the need to develop in teachers the ability to navigate in the flow of digital information, skills to work with it, process and incorporate it in the new technology. V. Astapovich suggested defining unified requirements to existing and emerging online course platforms that would merge into a system similar to a “single window” [6]. However, there is no comprehensive unified approach to the transformation of the higher education system today.

2 Methodology

In 2000, the Commission of the European Community presented the “Memorandum on Lifelong Learning” to the general world public, introducing a new paradigm of state

and individual responsibility for the development of human competencies throughout one's life. The basic conditions for the appearance of this document were as follows:

- Traditional learning technologies used in educational institutions are designed for generations X and Y, while the main active consumers of educational services are representatives of generation Z;
- The “LifeLong” paradigm, which involved the periodic development of adult competencies, is transformed into the “LifeWide” paradigm, which implements a continuous learning process (see Fig. 1).

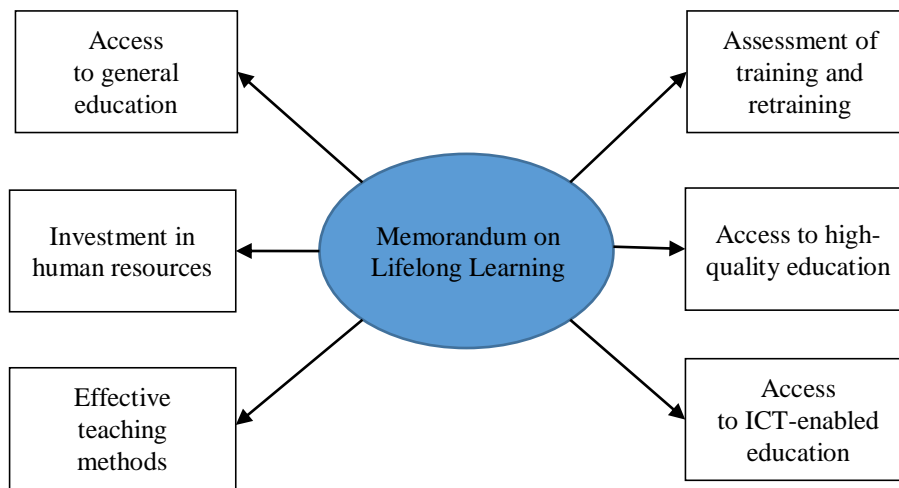


Fig. 1. Strategies of the Memorandum on Lifelong Learning.

The Memorandum envisaged the implementation of the following strategy:

- ensuring universal and continuous access to education to acquire and update the skills needed for long-term participation in the knowledge society;
- a noticeable increase in investment in human resources to prioritize the most important asset - people;
- developing effective teaching and learning methods and conditions for lifelong learning continuum in all its forms;
- significantly expand areas in which participation in studies and their outcomes are understood and valued, especially informal and non-formal education;
- ensuring that everyone has easy access to high-quality information and an archive of educational programs offers worldwide and throughout life;
- providing “lifelong learning” opportunities as close as possible to students, in their communities, and with the support of computing equipment where appropriate.

It can be said that it was after this fundamental shift in the pan-European (and then global) education paradigm that online educational technologies began to be actively introduced into the practice of the world's leading countries in the late 20th century. The main purpose of the introduction of distance technologies was to increase the number of students by increasing access to educational content, which removed one of the main restrictions - the geographical remoteness of holders and consumers of educational products.

The concomitant goal was to reduce the cost of educational services provided (by replicating them and due to the absence of the need to maintain spaces and teachers) while maintaining its price for consumers. Over the past thirty years, the popularity of online education has been only growing. For example, in the U.S., according to studies conducted by Sloan Consortium, there is an increase in the number of students who choose more than three online courses. As noted by American and European researchers, by 2025. "More than half of today's colleges may close, major players may merge, or may require a fundamental shift in their mission," they also note, "50 to 60% of U.S. university programs will be available online".

Today, when considering the problems of digitalization in scientific circles, it is common to use a more specialized classification. Generation X is called the analog generation, which is understood as the generation of people who were born before the emergence of computers and the Internet, because of their minds it is difficult for them to perceive information from the screen and they practically do not use computers. Generation Y is called a shift generation, which includes the generation that began to actively use the computer at a conscious age. Generation Z is represented by digital holders (digital generation) - the generation that does not know the world without mobile devices.

The digital generation is characterized by new somatic attitudes - they begin to communicate in electronic networks before they acquire handwriting skills. As a result, they have an "F-shaped mirror-like perception of reality". The speed at which they familiarize themselves with new information and assimilate it increases significantly. The basic attitude of the comfort of perception of information changes as well. The digital generation is not pronounced auditory learners like the previous generation; this generation is not ready to spend time on the perception of information through the technology of traditional lectures and seminars.

All the more so because it is proved that the level of information assimilation when using traditional learning technologies does not exceed 7-15%. While with generation Z comfortable learning technologies, which are distance learning modes, the human brain can learn much more information, because no time is spent on unnecessary operations. However, this is only possible with properly designed educational modules and programs.

American and European universities have created a network of schools for talented children of generation Z, the so-called university schools for gifted youth (e.g., the Education Program for Gifted Youth Stanford University), where during the learning process the most modern online technologies are used with the classes tutored by the leading university professors. Most of the leading national secondary schools cooperate with the Education Program for Gifted Youth Stanford University - today about 50

thousand children from different countries of the world are studying under this program. The most talented students are awarded grants to study at Stanford University upon graduation. These programs are implemented by universities under the slogan of humanization of education [7].

In the last five years, modern Western employers have begun to view specialists that received online education as the most promising ones, as these workers have higher learning capability and are more receptive to innovation. These specialists will be able to perform continuous educational consulting in the next 30 years of active working life without interrupting their work, which will allow the company to quickly and cheaply close the competence gap, which implies a high speed of solving non-standard tasks.

Many of the major international companies create corporate universities for the active implementation of new technologies - McDonald's (Hamburger University), IBM (IBM Global Learning), Microsoft, Cisco Systems, Xerox, Ford (Ford Learning Network), Reuters, and others.

To ensure the global competitiveness of Russian education and the entry of the Russian Federation in the top 10 countries in terms of the general education quality, the ambitious objective on the creation of Digital School by 2024 is set, in which the system of educational process organization, teachers' work, and administrative and economic management should be digitized [8].

There is a stable negative perception of online education in Russia. Domestic experts name its main drawback - low quality of education, due to lack of motivation of students. This bias was formed because during the previous twenty years distance education was mainly associated with extramural or supplementary education, which served as a disguise for the legal "trade" of higher education documents. The last decade in Russia was marked by the struggle of the Federal Service for Supervision of Education and Science with such dubious educational institutions. The conducted clearing of the higher education market from unscrupulous providers of educational services has restored consumer confidence in online learning technologies used by leading Russian universities.

Nowadays, almost any higher education program contains some components of electronic courses that are mastered in a distance learning mode. This is due to a whole complex of sociocultural reasons related to the low level of digital literacy of educational service providers, the desire to reduce costs of organizing the educational process, and the increased mobility of people in general.

The vast majority of Russian employers are not aware of the importance of digital learning technologies. The only exceptions are large corporations, which simply have to use these technologies of increasing the competence of their employees to maintain the competitiveness of their core business, mainly through the creation of corporate universities (learning organizations).

The mentality of generations X and Y are shaped in such a way that they stop learning on their own and quickly become "outdated" as professionals since during their studies it was believed that knowledge gained in universities would retain its competitive advantages for at least 20 years. All this is consonant with the duration of N. Kondratyev long waves with an average time lag of the technological wave being 30-40 years. And it is the representatives of these generations, though the most advanced of

them, who carry out the educational process in universities today. In this regard, we can name the following main shortcomings of the existing higher education system:

- The competencies of the graduates do not synchronize with the requirements of the labor market (according to the data of the Ministry of Labour and Social Protection of the Russian Federation in 2008 up to 73% of the graduates of higher education institutions completed their studies at the job at the expense of their employers) [9];
- The training format is focused on teachers, not clients, the educational programs are designed to meet the requirements of certain teachers, not (active and passive) consumers of educational services (Changellenge consulting company has found out that among the students “who have an average grade more than 4.5”, more than a third say that educational programs are out of date, about 40% think that training is not in compliance with the requirements of the labor market and more than a half highlight that higher education institutions provide little “practical training”) [10];
- The low motivation of students to study, that is they concentrate on memorizing information to succeed in interim and final assessment rather than on acquiring new knowledge and skills;
- Lack of involvement of agents of the real economy sector in the implementation of educational programs.

There is a problem while implementing a distant educational program –it is the identification of the person performing the task. In the modern world, this problem is solved with the help of contact work during video chats. In the structure of higher education, the application of studying part of a course at a distance using digital technologies occupies a special place in the educational process and is being used more and more often [11].

All the participants of the educational services market - both active and passive consumers and the suppliers - have realized the necessity of changes in the system of professional education. In recent years Ministry of Science and Higher Education of the Russian Federation has implemented many projects and initiated many programs on the introduction of online technologies into the university's activity. However, all those initiatives that are being actively implemented in the capital universities, were introduced with considerably less amplitude by regional educational institutions. Teachers of generations X and Y, because of low digital literacy and the stereotype that they will not find their place in the new format, prevented the active introduction of online technologies. The Spatio-temporal remoteness of the teacher and the student and their indirect-direct, virtual-real interaction weaken the traditional “strong bonds” between the teacher and the student. As a result, there is a serious risk of breaking these bonds [12].

For more than ten years since the introduction of the Federal Standards (FGOS) of the 3 generations the government has been declaring individualization of educational trajectories of students and creation of electronic educational environments, but no full-scale work was implemented in this respect. The educational community has been pretending that a new kind of educational content is being created and introduced, and the

state and society have been pretending that they believe that. It is these restrictions that prevented the system of higher education from efficiently developing in a synchronized way in the digital system of coordinates.

This resistance could considerably hinder the development of the modern system of higher education but for the COVID–19 pandemics that became a striking example of “The Black Swan 2020” which in Nassim Nicholas Taleb’s terminology means hard-to-predict and rare events that have considerable consequences. For some months COVID–19 has completely turned upside down people’s ideas of limits for their capabilities and to a large extent has blurred alleged restrictions of generations X and Y. Challenges of digitization and the changes of the reality perception paradigm, that have been largely discussed in the sphere of higher education worldwide, have immediately penetrated the practice of transferring educational products, including in Russia. For several months markets and parameters of labor have transformed considerably all over the world.

The year 2020 comes and “The Black Swan 2020” emerges and for several months breaks the customary paradigm of denying a new reality for all of us. For a very short period, the electronic educational systems have been filled up with educational materials, the educational community is massively studying new information technologies, students and middle-aged people start to use the Internet not for entertaining, but for developing their professional and supra-professional competencies. It turned out that a big volume of high-quality educational content “Arzamas”, “Lektorium”, “Znaniyum” had been elaborated and is freely available, and teaching staff will either adapt to new replies of online education or will be replaced by virtual tutors. Of course, there are still many questions concerning the quality of educational content, but the reality is that either the quality of the educational content will be soon considerably improved or these teachers and universities will become non-demanded. Astrakhan State University was also affected by the one-step transition to digital reality. Thus, within one week the Moodle system was packed with educational content, tasks were uploaded for the current and intermediate assessment of students (see Fig. 2).

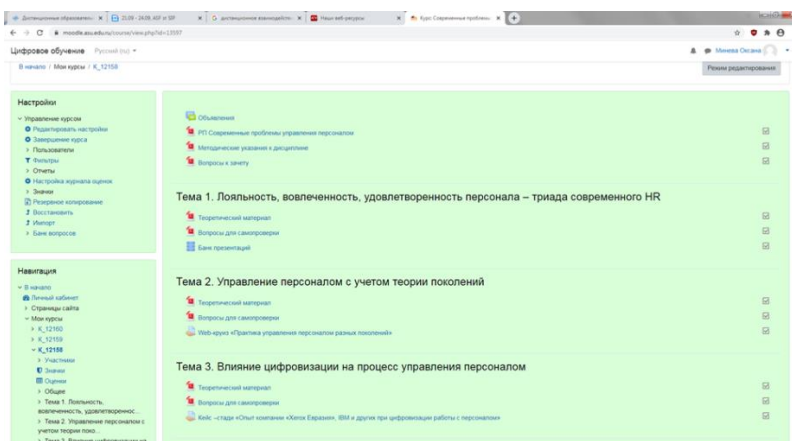


Fig. 2. The interface of a page from the Moodle system of Astrakhan State University.

At the same time, the “Digital Volunteer” project for teachers of generation X and Y was launched under the patronage of students of the Faculty of Digital Technologies & Cybersecurity. The new format of communication was positively received by the students and most of the teaching staff. However, after a few months of remote interaction, there were reports of the decline of enthusiasm in students and teachers, due to the impossibility of offline interaction.

This situation was observed in almost all educational institutions. Also, the robotization of production and digitalization of services will lead to a reduction of about 47% of “traditional” professions until 2035, and the remaining professions are expected to undergo a fundamental change in qualification requirements, competencies, which change the very nature of employment. In the professions of the future, modern scientists pay great attention to the formation of supra-professional competencies (ability to work in a team, knowledge of the fundamentals of lean production, multilingualism, self-management, etc.), which is impossible without offline interaction between teacher and student.

Today it is necessary to significantly change the educational programs proactively, because of the following tendencies:

- Robotic automation of production process results in reduced employment in the production sphere and at the same time in an increased number of those engaged in services (though these processes are temporary and any time soon the services sphere will be also subjected to total introduction of artificial intelligence and dramatic reduction of vacancies for people);
- Overwhelming digitalization blurs the boundaries of national and world labor markets, promoting globalization, enhancing the spread of remote work practice;
- Considerable reduction (up to complete disappearance) of some “traditional” professions together with the appearance of new ones (according to C. Frey and M. Osborne by 2033 in the USA robotization will supersede more than 47% of jobs existing in 2018, in Germany - 35%, in Japan - 21%, in Russia - up to 30%. And according to the World Bank in China this figure may reach 77% by 2033);
- Fundamental changes in qualification requirements, competencies in most of “the traditional” professions, that alter the essence of occupation.

Modern researchers pay great attention to forming supra-professional competencies (team working, knowledge of essentials of lean production, multilingualism, self-management, etc.) in the professions of the future. However, the traditional paradigm of education (school-college-university) expects the students to be “equal” in compliance with the education standards, accustoming the young generation to depersonalization. The educational process is in great discord with the demands of the future labor market that are being shaped. To compensate for the influence of reduced relevance of the rendered educational services, which results in the fact that the working-age population feels unwanted, so-called Atlases of future professions are being created on the global and national levels. They take into account the technological, social, and economic changes, strategic development plans of leading companies, that will enable them to

form strategic competitive industry-specific “Maps of the Future Business World”. Besides global education, online media are being worked out.

3 Results

The development of the Russian higher education system after the creation of a working hybrid educational environment based on the E-Learning principles laid down in the “Memorandum on Lifelong Learning”. This includes:

- Changing the teaching paradigm in secondary school so that all secondary school leavers develop digital literacy skills [13];
- Developing centers of attraction for talented children in schools for the implementation of analog Education Program for University – pre-university studies (at least one in each region), which will significantly humanize the entry into the higher education system and increase the international mobility of potential applicants;
- Implementing “40-40-20” self-management principles in the national education system, which means that 40 percent of the student's time is spent on distance learning, about 40 percent - on full-time, and the remaining 20 percent on self-education;
- Changing the education format completely from professor-centered to client-oriented (generation Z is highly rational and educational programs synchronized with the labor market should be offered to increase their study motivation);
- Digitalizing all educational programs to improve the convenience of the services provided to generation Z consumers.

We propose the creation of “Caspian Intellect”, a decentralized interactive AI-enabled educational platform. Fig. 3 presents our vision of this digital tool.

4 Discussion

Trends in higher education development are clear and transparent. But some problems should be solved in advance. Among them are the following:

- Are our educational institutions, business, society, and infrastructure ready to train the most in-demand specialists of the future;
- What to do with released personnel carrying the competencies of outdated and dying professions - society realizes it is almost impossible to retrain them in the context of promising professions of the future;
- How to increase the motivation of all generations to master universal supra-professional skills and abilities providing competitive advantages to specialists and enable them to quickly adapt to the highly competitive environment of the labor market of the future;

- Where to get techniques, trained tutors, an accessible environment that could help an accomplished specialist with a traditional education to be trained online and find their place in the labor market of the future.

These challenges can slow down the ongoing development of the national higher education system and require a detailed study by the professional community.

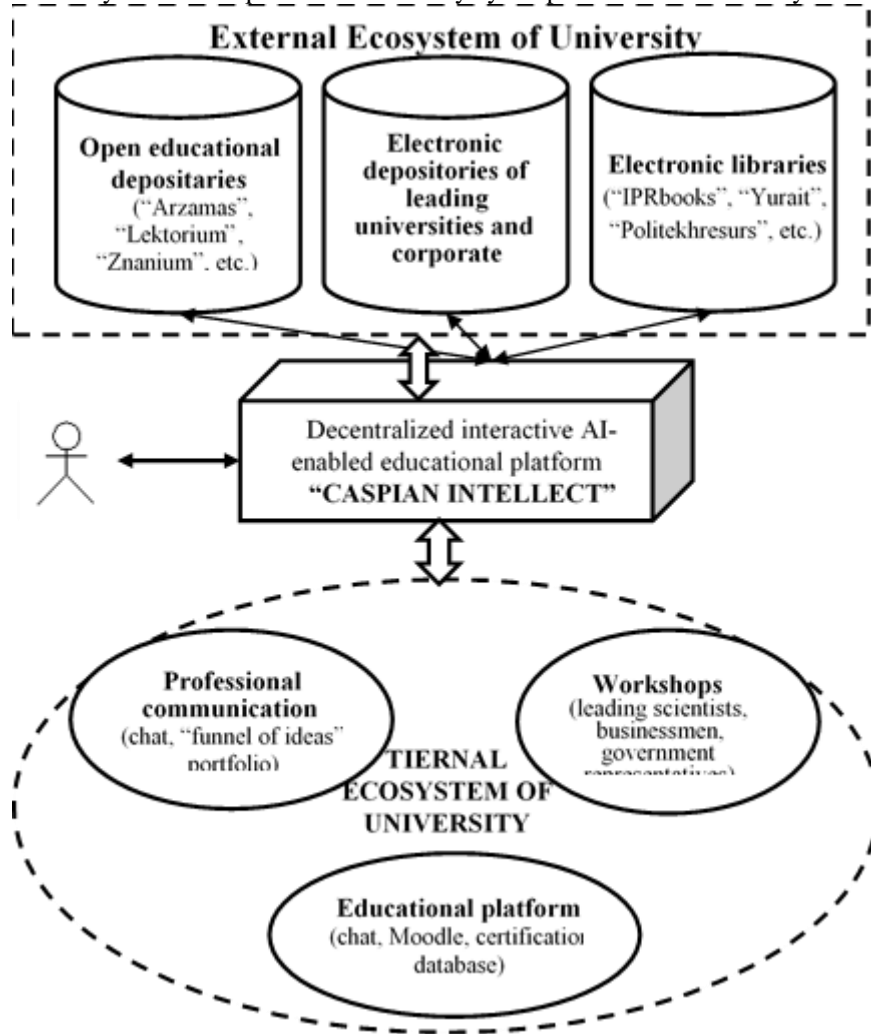


Fig. 3. The diagram of distance education in the framework of an interactive educational platform.

Improving the qualifications of teaching staff, developing scientific research, networking with leading universities and employers, holding conferences, seminars, schools -

all this will help to raise the professionalism of a university teacher to a higher level, which will invariably improve the quality of training specialists [14].

5 Conclusion

Quality education is possible only in a new educational environment, focused on the use of information and communication technologies. Thus, in each specific case, methods and ways of teaching should be correlated with the goal set during training, to choose the most modern technologies that meet the pedagogical, developmental, and training objectives of the lesson [15].

“Black Swan 2020” today sets a new goal for higher education – to become the flagship of digitalization and humanization of society. The University community should lay the foundation for changing not only its horizontal but also the entire vertical educational trajectory of the population (primary, secondary, vocational education). It is universities, as places with a traditionally high concentration of the most educated and intelligent part of society, that should promote the idea of humanizing higher education, increasing the ability of socially vulnerable segments of the population to access this horizontal education since these segments of the population today can increase the marginal layer of society.

The higher education system today should be the initiator of introducing a trend for self-learning socially-oriented companies that are created through the collaboration of social and functional insourcing for training, taking into account the latest digital trends. The challenges the higher education system is facing today are so large-scale that only the joint work of state educational authorities in the leading countries of the world will help national economies and society survive this difficult moment, preserving the ideas of education, humanization, and human rights to self-determination as an axiom for the development of modern society.

The list of IT technologies used in education is constantly expanding, including through new social media and web 2 services. The number of implemented educational innovations is increasing [16]. The achievement of a high-quality educational process is possible only with the effective work of the teaching staff, modern methodological support of the educational process, the use of models, and quality management systems. All these components are aimed at achieving a single result - the training of a highly qualified specialist in demand in modern conditions [17] will allow teachers to organize at the high-level studies using modern information and communication technologies meeting all requirements of standards which, further it will be possible to certify, etc. [18]. Modern enterprises are in urgent need of an influx of young mobile personnel, that is explained by the country's new course for the implementation of the National Technology Initiative as one of the priorities of state policy, and we see the main task in creating conditions for the training of future personnel, corresponding to state priorities for the development of science and technology, able to develop in their home city, thereby increasing its economic potential [19].

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