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**CHALLENGE OF DIGITAL ECONOMY - DIGITAL
TRANSFORMATION OF EDUCATION**

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Abstract

The article addresses the problem of higher and corporate education transformation in response to the challenges of the digital economy. The contemporary requirements of the digital economy to the system of higher professional education and staff training are analysed. The perspective tendencies of digital professional education development nowadays are defined. It is substantiated that the construction of a united informational and educational space, accessible to all the participants of the educational process, determines the development of corporate retraining and advanced professional training systems meeting the requirements of both business and the society as a whole. The levels of transformation in the field of education and corresponding improvements to be made in each of them are revealed. The current state of the digital transformation of education in the training of specialists in the fields of "Management", "Social work", "General medicine", "Pediatrics", "Dentistry", "Medical biochemistry", as well as in the training of postgraduate students and the advanced professional training of teaching staff members is considered by the example of Volgograd State Socio-Pedagogical University and Volgograd State Medical University. The obtained data can be implemented in the development of the curricula, as they allow focusing the attention on the issues of digital transformation of education.

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Keywords: Digital economy, digital competence, education transformation.



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1. Introduction

The ways of higher professional education development require a deep understanding in terms of the transition to the digital economy, as this is the only way to direct the vector for the advanced education strategically correctly.

1.1. The digital economy is the economy of new speeds determined not so much by the movement of goods, but by the speed of informational processes within the new framework of the "Internet of things".

The process of analog systems replacing with digital ones has been going on since the 1970s. Traditional calculations and engineering graphics were replaced by digital modelling; apparatuses and sensors that previously displayed the state of the object or process simply physically, became digital. So, the new industrial revolution is not just going on, but has been going on for a long time – the stages of the path are just changing.

Currently, the advance in productivity is due to the combination of traditional operating and information technologies, as well as the spread of "smart (self-regulated) machines". The data is meanwhile transformed not only into the main tool for creating a new value, but also into an independent product. The scaling of these technology solutions, apart from other outcomes, will lead to the emerging of millions of previously unknown goods on the market in the next 3-5 years. These are the so – called "digital twins" - virtual machines and digital copies of physical objects that aggregate data, models and software applications. They are peculiar in being tied to the object throughout its life cycle, existing and changing together with the object. A new type of assets appears in the economy – digital, and a new type of capital – informational.

Correspondingly, the new industrial revolution is called the "digital transition" or "digital transformation", the social system is defined as "platform" or "digital" capitalism. It is considered as a new stage of globalization. (Goloventchik, 2018; Rogers, 2018).

The digital economy is the economy of another level of observability and traceability of all technological operations. This is the economy of other scales, being set, first of all, by the boundaries of digital networks and platforms. This is also the economy of another level of efficiency. It requires development of business intelligence and performance management control systems (Miksjuk, 2017; Rausch, 2013). Competition currently becomes largely digital, a new concept being developed – “digital competition”.

Involvement into the new industrial revolution is of crucial importance for both countries and companies. The alternative would be to leave the market or move to its deep periphery. In the next 5-10 years, digital transformation will be the main task of the majority of players seeking to strengthen their positions in the market. They must learn how to create and manage digital assets demanded by the market.

1.2. Digital transition is an interdisciplinary and complex task for a new generation of managers and engineers

The basis of the digital transition should be the choice of owners and staff training. Numerous surveys of engineers and managers over the past 3-5 years show that technology is no longer a barrier to the digital transition. It is restrained mainly by outdated models of staff organization and lack of readiness to innovate.

To solve the problems faced by Russian companies – at least leading and claiming for leadership in the market – it is necessary to quickly and comprehensively retrain managers and chief technology specialists. The companies have a maximum of 2-3 years to achieve these aims.

The transformation of the analog economy to the digital one required the appropriate human resources. For example, App economy (Kondurar, 2012) is considered to be an independent part in the digital economy, a key indicator of which is the number of professionals able to develop applications for the smartphone. The best of them get an opportunity to move and work in smart cities. Taking into account the development of digital communications and intellectual mobility, physical relocation itself is not obligatory and a person can, staying in their usual environment, work quite on the other end of the globe, getting a reward for their work. As Don Tapscott claims, a new generation is growing up digital being a “net generation” (Tapscott, 1999).

It is worth noting that it is applied not only to individuals, but to the project or production teams. Projects of complex engineering facilities and objects are developed in digital space involving several countries or several continents. Due to this fact, not just a diploma of education, but skills actually confirming the qualification of a particular employee, are in demand. (Kovalev, 2018)

One may say that the term "skills" has gained an international recognition, in fact, together with the term "digital economy", though it was used earlier. Expanding of digital technology usage directly in the workplace will increase the demand for new digital skills in the following areas (Table 01.).

Table 01. Areas of new digital skills

Type of digital skills	Features	Examples
General information and communication technology skills (ICT skills)	Enable the use of the technologies in the daily routine	Skills of searching the Internet for the information or using the software to solve current problems
Professional skills for the production of ICT products and services	Means of labor in the new economy is a prerogative of ICT professionals with the skills in programming, application development (APP), data management and networking	Software, web pages, e-Commerce means, financial technology, cloud data, Internet of things and large data
Complementary ICT skills providing the performance of new tasks associated with the use of ICT in the workplace	Using ICT leads to the change in the ways of duties performing which causes an increased demand	Use of social networks for communication with colleagues and customers, promoting brand products in the e-Commerce platforms, large data analytics, business planning, etc.

Comprehensive mastering of all types of ICT skills leads to rapid growth of digital economy on the whole, resulting in high variability of the demanded ICT skills, their adaptability to the new working conditions and increase of functionality (Cupriyanovskiy, 2017).

In addition, there has been an evolution and transformation of the basic concepts of management: finance-oriented management, marketing management, quality management (process-oriented management), knowledge management (cognitive management), which is closely related to the concepts of the intangible economy - knowledge economy — digital economy, underlying the optimal organization of the company's processes.

Cognitive management is the systematic management of the processes through which knowledge is generated, identified, accumulated, distributed and applied in the company (or other institutions) to improve its activities (Krasikova, 2017; Zakharyev, 2017). Cognitive management is connected with organizational knowledge. Most importantly in the cognitive management, there is a continuous learning through varied experiences. Realizing that knowledge becomes the most important resource and the key direction of economy development, leading companies seek to constructively overcome resistance to implementation of cognitive management technologies. The main goal of cognitive management technologies is to support decision-making aimed at reducing operational costs, increasing revenue, improving competitiveness and efficiency of almost any business or simply getting an advice on request. With the development of cognitive technologies, the very principles of working with information will be changed in the nearest future, like personal computers once changed the life. Due to the accumulated knowledge, the assistant systems will be able to give a reasonable advice on performing a specific business task, to outline the steps of its solving, to monitor the implementation and to prioritize the activities.

2. Problem Statement

The range of issues addressed by digital transformation of professional education in Russia is presented by the following statements:

- The digital economy presents new requirements to the system of education and staff training (Badarach, 2012).
- The role of virtual educational institutions in the training of competitive employees, managers and specialists is growing.
- Educational expenses increase significantly on a global scale
- Most developing countries and those with transitional economy lag behind the advanced countries, while offering the traditional education. At the same time, modern challenges to the economy and competition demand greater flexibility in the traditional educational process. First of all it deals with IT education and development of IT skills (Kurbackij, 2017).
- More and more factors indicate the necessity of paradigm shift for the training system, including the education system (Nordman, 2017; Vorontsov, 2017).

2.1. Perspective trends in the development of digital professional education

Awareness of the perspective trends in the development of digital professional education will contribute to the transformation of education, and it is not only about training of managers, engineers, but also involves the field of health care specialists training. The construction of a united informational and educational space, accessible to all the participants of the educational process, is a crucial aspect that determines the development of higher professional training, advanced professional training and corporate retraining systems meeting the requirements of both business and the society as a whole. Building a single information and educational space, accessible to all participants of the educational process, can be seen as the cornerstone of the transformation of education, which determines the adequacy of the construction of the system of higher education, training, corporate retraining as the requirements of business and society as a whole. Experts consider the necessity of improving digital literacy of students and teachers and their complex thinking development to be the most significant trends influencing the technology implementation into the educational process (Johnson, 2015).

2.2. The problem of the digital transformation in the sphere of professional education involves the identification of levels and the demanded transformations to be performed

In order to transform education in response to the challenges of the digital economy, it is important to understand the current state of vocational training of students and professionals, as well as training teaching staff members for the implementation of innovative trends.

3. Research Questions

The problem of digital transformation of education is multifactorial. It was studied by many scientists (Bacsich, 2012; Blair, 2012; Belotserkovets, 2012; Dobrynin, 2016; Kupriyanovsky, 2017) but the search for solutions to a number of issues is still going on.

3.1. In theoretical terms, it is important to develop a methodological basis for the digital transformation of education

Differentiation of the levels of the digital transformation of education taking into account the perspective trends in the development of digital vocational education is a basic component of this methodology.

3.2. In practical terms, a problem of educational process modelling taking into account the digital transformation of education should be solved

While organizing the educational process, it is necessary:

- to provide training (advanced training, professional retraining) of teachers with digital literacy, capable of creating an informational and educational environment, developing digital educational resources and implementing them into the educational process;
- to identify the specifics of the digital transformation of education depending on the type of discipline taught;

- to apply innovative technologies in training, like a system of "virtual patient" and Internet simulators for medical students, as well as the educational content that will be in demand in the professional life of a specialist, for example, electronic medical records, telemedicine, cloud technologies for keeping records and personal data of students and service users and other opportunities of digital medicine (Rogalsky, 2016; Zezulinskiy, 2014).

4. Purpose of the Study

The purpose of the study is to analyse the state of the digital transformation of education at Volgograd State Socio-Pedagogical University and Volgograd State Medical University and to generalise the experience of this activity at the levels of undergraduate training and advanced professional training.

4.1. To study the levels of the digital transformation of education.

This task involves the search for perspective trends in the development of digital professional education and the study of the levels of the digital education transformation by the example of the Universities.

4.2. To generalise the experience of teaching and to substantiate the areas of digital transformation of undergraduate and advanced professional training.

The presented research problems of the digital transformation of education are considered taking into account the experience of the teaching staff members of the universities listed earlier.

5. Research Methods

The methods of generalization, comparison, observation, systemic analysis, data grouping and theoretical cognition were utilized by the researchers.

6. Findings

6.1. Digital transformation of education: promising trends and levels of transformation.

Summarizing the results of the research on digital education development in Russia presented in the works of a number of scientists (Kondurar, 2012; Selivanov, 2015; Tulchinskii, 2017; Zakharyev, 2017), it is possible to identify the following promising trends in the development of digital professional education:

- integration and differentiation of management structures, educational institutions, forms, content and systems of vocational training, retraining and advanced training;
- humanization of the content of vocational training;
- intensification of training due to the novel pedagogical technologies and systems;
- integration of science, culture, education and production as a basis for ensuring the quality of training, retraining and advanced training;
- expansion of the professional profile and transition to training of specialists in occupational groups;

- development of educational and economic activity of educational institutions with consistent trend for independence and expansion of service;
- outsourcing of educational services in the business education market;
- raising the status of education, involving the generation of “digital aborigines” into demanded vocational activities (Loginova, 2015; Medennikov, 2016; Nikolaeva, 2017).

The digital transformation of education in the Russian Federation is divided into several levels. The macro level, the Federal level, is responsible for the strategic approach development. On the one hand, it involves the requirements for the results of training formulated in the Federal state educational standards of higher education, which list competencies dealing with information and communication technologies among others. On the other hand, the requirements for higher education institutions accreditation specify the obligatory availability of computers and computer classes, software, free access to the local network and the Internet, electronic document management, development of a website of the University and its departments, teaching staff training in the field of ICT, etc. According to the professional standard, the educators in the system of higher professional education and advanced training have to provide e-learning, use distance learning technologies, informational and communication technologies, electronic resources. The requirements are met by universities presenting the mid-level of organizational and pedagogical processes. The organizational aspect means the material and technical support of digital transformation of education, namely the constant updating of computers and software, modernizing wireless networks.

At the Volgograd state medical University these activities are coordinated by the Centre of information technologies. The Centre for distance and virtual educational technologies, Telemedicine Centre, Centre for specialists’ certification and Simulation Centres for cardiovascular surgery, obstetrics and gynaecology are implementing digital technologies into the educational process. At a University level, the issue of training teachers in ICT is also being addressed. There is an ICT module in the curriculum of professional retraining of teaching staff members of vocational and additional professional education. Teachers have the opportunity to improve their skills in the course of pedagogics and educational technologies of additional professional education in the following aspects: "Information and communication technologies among the methods of professionally oriented training", "Information and communication technologies among the current issues of educational process management", "The use of interactive teaching equipment and modern software in the educational process", "The use of distance learning system "Moodle". This opportunity is also provided by the courses of distant learning and webinars. However, the digital transformation of education will be considered effective if the transformation is carried out at the mini-level - that of practical training. All transformations at the previously listed levels create the basis, and the actual integration of digital technologies into the educational process takes place in the problem-oriented informational and educational environment of classes and lectures.

6.2. Teaching experience with the focus on digital transformation of education.

The analysis of the current state of the problem worldwide shows that the computerization of the educational and professional environment includes two parallel processes – the development of

information infrastructure and the development of new methods of information support, influencing both the nature and content of all the human activities. (Krasikova, 2015; Zakharyev, 2017).

The main subjects of the transformation regulation are the professional community and consumers. At the same time, the needs of teachers and students in the digital transformation of education differ. Teachers face the necessity of development and implementation of new telecommunication and web technologies into the educational process (Artyukhina, 2017). Educational needs of postgraduate students and university teaching staff members in the sphere of information and communication technologies are studied and taken into account in the course "Pedagogics and methods of teaching in higher education".

Therefore, considering the digital transformation of education, the algorithm of training involves a number of stages.

- Clarification of educational needs in the sphere of new information and communication technologies with the corresponding correction of the curricula of undergraduate, postgraduate and additional professional programs;
- Conducting competence-oriented and interactive classes in the computer lab. Training is based on the andragogical model. The trainees acquire the skills of handling a wide range of digital devices to meet educational needs, understanding the essence of different information and communication technologies, their optimal choice, development and use of electronic educational resources. The research work of teaching staff members is focused on identifying the specifics of the digital transformation of vocational training depending on the discipline taught.
- The control of the mastery in digital educational technologies implementation is organised in the form of completing individual or group tasks. The use of new technologies and digital educational resources is the mandatory requirement for a post-graduate student or a teaching staff member (Starichenko, 2015).

Summarizing the experience of teaching students in the fields of "Management", "Social work", "General medicine", "Pediatrics", "Dentistry", "Medical biochemistry", we can draw the following conclusions:

- Creating informational and educational medium for interaction with students, a teacher uses the entire armamentarium of tools, taking into account the specifics of the discipline. The examples are communication via e – mail and educational portal, the use of smartphones, laptops, netbooks in the classroom according to the principle "Bring your own devices", proposed by scientists of the Institute of educational technology (the UK).
- Having previously studied computer science, students use teaching-controlling programs, a professional e-database, web quest technology, interactive mental maps, Google surveys, a system of "virtual patient", etc., which allows them to master the course content. Students also contribute to the digital transformation of the educational environment and willingly participate in the creation of electronic educational resources – from a web quest to an educational video.
- Project activities of students with the use of information and communication technologies allows to actualize their creative potential, contributes to the formation of research

competences, ensures integration into a professional information environment and amplifies the practical orientation of training.

The digital transformation of education is a continuing process and its ability to meet the challenges of the digital economy depends not only on the constant updating of the infrastructure, but also the motivation and willingness of teachers and students to use the proposed and to create new electronic educational resources.

7. Conclusion

Professional thinking is formed, first of all, within the line of the subject targeting. So, the process of assuming and anticipating the results of the activities by all the participants of educational process is of particular importance for the process of consolidation of the interests of society, business and education.

7.1 Organizing a system of training, corporate retraining and advanced training of specialists.

Implementation of the proposed approach requires active involvement of postgraduate students and teaching staff members in the development of educational projects and their implementation into the practical training of business and medical specialists.

Life-long learning and continuous professional development of any specialist requires the readiness for mastering and implementation of new information and communication technologies into the educational process.

7.2 The use of digital transformation of learning in the classroom

The use of digital transformation of learning in the classroom depends on the interaction of the teacher and the students. The proposed algorithm provides the opportunities for more efficient management of the class period, deep involvement of students into the information and professional environment and participation in its transformation, contributes to the creative development of students' intelligence.

The presented data can be implemented in the development of curricula, as they allow focusing on the issues of digital transformation of education.

References

- Artyukhina, A.I., Chumakov, V.I., & Petrov, M.V. (2017) *Projecting and implementation of telecommunicational and web technologies in educational process of a higher professional medical educational establishment*. Volgograd: VolgGMU.
- Bacsich, P. (2012) *Alternative models of education delivery: Policy Brief, September, 2012*. Moscow - UNESCO Institute for Information Technologies in Education. Retrieved from: http://iite.unesco.org/files/policy_briefs/pdf/en/alternative_models.pdf (25.07.2013)
- Badarach, D., Khoroshilov, A.V. (2012) UNESCO initiatives in the sphere of the use of informational communicational technologies in higher professional and technical education. *Educational policy, 1* (57), 112-121
- Belotserkovets, V. V. (2012) New economics: terminological retrospective and present. *Vestnik KGU, 6*, 26-29. Retrieved from: <http://cyberleninka.ru/article/n/novaya-ekonomika-terminologicheskaya-retrospektiva-i-sovremennost>.

- Blair, K., Schwartz, D. (2012) *How technology can change assessment: Policy Brief, October, 2012*. Moscow - UNESCO Institute for Information Technologies in Education. Retrieved from: <http://iite.unesco.org/pics/publications/en/files/3214710.pdf> (22.06.2013)
- Dobrynin, A. P., CHernyh, K. YU., Kupriyanovsky, V. P., Kupriyanovsky, P. V., & Sinyagov, S. A. (2016) Digital economy – various ways of effective implementation of technologies (BIM, PLM, CAD, IOT, Smart City, BIG DATA etc). *International Journal of Open Information Technologies, 1*, 4-11. Retrieved from: <http://cyberleninka.ru/article/n/tsifrovaya-ekonomika-razlichnye-puti-k-effektivnomu-primeniyu-tehnologiy-bim-plm-cad-iot-smart-city-big-data-i-drugie>.
- Goloventchik, G.G. (2018) Digital economy as a new stage of globalization. *Digital Transformation, 1*, 26-36.
- Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2015) *NMC Horizon Report: 2015 Higher Education Edition*. Austin, Texas - The New Media Consortium.
- Kondurar, M. V. (2012) The concepts “competence” and “expertise” in education. *Science Vector of Togliatti State University. Series: Pedagogy, Psychology, 1*, 189-192.
- Kovalev, M.M. (2018). Education for the digital economy. *Digital Transformation, 1*, 37-42.
- Krasikova, T. YU., & Ognev, D. V. (2015) Regional scientific-educational system as an element of the regional innovation system: Internal interrelations, criteria for the estimation of its efficacy. *Proceedings of Irkutsk State Technical University, 11 (106)*, 137-142.
- Kupriyanovsky, V. P., Suhomlin, V. A., Dobrynin, A. P., Rajkov, A. N., SHkurov, F. V., Drozhzhinov, V. I., Fedorova, N. O., & Namiot, D. E. (2017) Skills in digital economics and the challenges of the educational system. *International Journal of Open Information Technologies, 1*, 19-25.
- Kurbackij, A.N., Vorotnickij, Y.I. (2017) IT-education under conditions of digital transformation. *Digital Transformation, 1*, 7-12.
- Kupriyanovsky, V. P., Dobrynin, A. P., Sinyagov, S. A., & Namiot, D. E. (2017) The complex model of transformation in digital economics – how to become digital leaders. *International Journal of Open Information Technologies, 1*, 26-32 Retrieved from: <http://cyberleninka.ru/article/n/tselostnaya-model-transformatsii-v-tsifrovoy-ekonomike-kak-stat-tsifrovymi-liderami>.
- Loginova, A.V. (2015) E-learning: causes of the ignorance of the “digital aborigines” generation. *Young scientist, 10*, 1212-1215.
- Medennikov, V. I. (2016). The concept of efficacy in the epoch of digital economy. *Nikonovskiy readings (Nikonovskiye chteniya), 21*, 257-261.
- Miksjuk, S.F. (2017). Portrait of a modern manager in the context of information management systems of the company. *Digital Transformation, 1*, 32-37.
- Nikolaeva, E. M. (2017). Organization of the educational process in terms of new media environment. *Izvestiya of Saratov University. New Series. Series: Philosophy. Psychology, 2*, 162-166 doi: 10.18500/1819-7671-2017-17-2-162-166.
- Nordman, I. (2017). Interaction of educational paradigms: New approach to knowledge management. *The European Proceedings of Social & Behavioural Sciences, 116*, 992-1000. doi:<http://dx.doi.org/10.15405/epsbs.2018.02.116>.
- Rausch, P., Sheta, A. F., & Ayesh A. (2013). *Business Intelligence and Performance Management: Theory, Systems and Industrial Applications*. London: Springer.
- Rogalsky, E. (2016). The use of cloud services for creation an electronic abstract of student. *Informatization of Education, 1*, 21-30.
- Rogers, D. (2018). *Digital transformation*. Moscow- Tochka.
- Selivanov A. V. (2015). The scientific problems in the economics and the society of knowledge. Northern (Arctic) Federal University Bulletin. *Series “Humanitarian and Social Sciences”*, 2, 58-63.
- Starichenko, B.E. (2015). Professional standards and ICT-competence of the teacher. *Pedagogical education in Russia, 7*, 6-15.
- Tapscott, D. (1999). *Growing up digital: the rise of the net generation*. New York- McGraw-Hill.
- Tulchinskii, G. L. (2017). Digital transformation of education: Challenges for higher school. *Philosophical Sciences, 6*, 121-136.

- Vorontsov, A.L., Vorontsova, E.V. (2017). Innovative development strategy of higher education system and Features of Its Implementation. *The European Proceedings of Social & Behavioural Sciences*, 165, 1415-1424 doi:<http://dx.doi.org/10.15405/epsbs.2018.02.165>.
- Zakharyev, V. V. (2017) Innovational challenges for the educational system in the conditions of the economics of knowledge. *Innovations*, 4, 81-85.
- Zezulinskiy, N. (2014). *Digital medicine signifies a new epoch of medicine*. Retrieved from <https://www.itweek.ru/idea/article/detail.php?ID=1615084>.