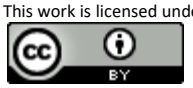
Available online at: https://ijact.in

Date of Submission	06/10/2020
Date of Acceptance	20/10/2020
Date of Publication	31/10/2020
Page numbers	3906-3911 (6 Pages)



ISSN:2320-0790

An International Journal of Advanced Computer Technology

APPLICATION OF BLOCKCHAIN TECHNOLOGIES, CROWDSOURCING AND ARTIFICIAL INTELLIGENCE IN STUDENT TRAINING

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Abstract: The article explored new needs in the higher education system in Russia in the context of global digitalization of society. The innovative possibilities of using the new social network technologies blockchain, big date, collective intelligence technologies, artificial intelligence in higher education were analyzed. Russian projects for their use in the practical activities of Russian teachers are considered. Based on the methods of system analysis, new guidelines in the training of specialists have been identified and characterized: the development of forms of collective creativity, participation in complex projects based on blockchain technologies, the involvement of initiative youth in the framework of crowdsourcing technologies, the development of individualized training based on artificial intelligence technologies. The modern Russian higher education system is striving to fulfill these needs, but at the moment, innovations are at the stage of pilot projects. There is a need for their wider development and mass adoption.

Keywords:network society; Russian higher education; crowdsourcing; blockchain; big date; collective intelligence technologies; artificial intelligence.

I. INTRODUCTION

The digitalization of all spheres of life in modern society presents new requirements for the modernization of the higher education system. The development of new social networking technologies actualizes the problem of their use for educational purposes, including the Russian market of educational services. An analysis is required of the impact of new information social network technologies on collective creativity strategies, on the processing, structuring and storage of information, on new methods and approaches in the higher education system.

II. MATERIALS AND METHODS

The pilot projects stood as the research materials, which based on strategies for using new social networking technologies, such as crowdsourcing, blockchain, big date, and collective intelligence and artificial intelligence technologies. To consider the specifics of the work of new network technologies in higher education, we used a systematic approach, hermeneutic methodology, and axiological method.

III. RESULTS

New strategies for the formation of professional education based on new social networking technologies are present in the Russian system of higher education as individual projects. There is a need for their wider use, taking into account the development trends of a network society.

IV. DISCUSSION

The development of the higher education system in Russia within the framework of building the information society is mostly determined by the ability to adapt innovations in the field of information technologies to their needs. The development of new network technologies creates fundamentally new opportunities for increasing the efficiency of mastering educational programs and, at the

same time, also creates new risks due to problems of digital inequality, the costs of information wars [1].

At the beginning of the XXI century, scientists focused, on the one hand, on the qualitative characteristics of information, which led to the emergence of the concept of knowledge societies. On the other hand, they examined the threats posed by the growing variety of information interactions, which led to the emergence of the term "risk society". Today, researchers are paying more attention to analyzing the global network nature of the information society.

The development of networks of various levels and the interaction between them in the context of an avalanche-like increase in information flows determined the demand for new technologies based on collective strategies for the development, processing, structuring and storage of existing and created knowledge. Given the ongoing social and technological changes in the information society and the development of social networking technologies such as blockchain, crowdsourcing and collective intelligence, it is necessary to search for new strategies in vocational education in Russia. Moreover, there is need in the development of approaches to the management of education in the university cluster that meet the requirements of modern social reality.

The purpose of the study is a comprehensive analysis of the impact of modern social network technologies (such as blockchain, crowdsourcing, and collective intelligence), based on collective strategies for the development, processing, structuring and storage of existing and generated knowledge. Also based on the creation of new vocational education strategies, approaches to managing education in a university cluster, aimed at the formation of professional and personal qualities of the student.

The purpose of the study determines the main tasks of the work such as:

1) to reveal the specifics of modern technologies of social networks (crowdsourcing, blockchain, big date, collective intelligence technologies, artificial intelligence); 2) to analyze the impact of social networking technologies on the formation of professional and personal qualities of a student; 3) to identify new educational strategies and approaches to educational management in the university cluster of Russia, aimed at the formation of professional and personal qualities of a student and compliance with current trends in the information development of society. The theoretical and practical significance of the study includes a synthesis of trends related to the needs of modern education. This could be helpful in the development of specific methods and educational programs for the training of highly qualified professionals.

At present, it seems very relevant to conduct a methodological analysis of social networking technologies in the context of changing vocational training. It is necessary to develop a strategy for the modernization of the existing education system and determine its basic principles and directions. In recent years, scientists have been actively discussing the main trends and prospects of the transition of the information society from the stage of the post-industrial society; to the knowledge society, risk society [2-5]; and finally, the network society [6-8].

The versatility and non-linearity of social processes in the digital age makes the search for forms of social life that are adequate for them that affect the vocational education system designed to reflect the needs of the modern era. Networked social structures are becoming the most demanded these days. The main features of the network organization is the lack of a single center and hierarchy. Relations of cooperation prevail over relations of differentiation and competition. If in a hierarchically organized society individualistic selfish interests were determining, then in a networked society the basis for success is the ability to work in a team. The importance of collectivist values sharply increases, focusing not so much on achieving personal success as on solving a common problem. The inability for a particular scientist to study and master the entire flow of information, even in a highly specialized field, especially in interdisciplinary research, causes the need for collective creativity. In the process of obtaining professional education, such forms of interaction between the teacher and students as MOOC (mass open online courses) become popular. Studies of the capabilities of MOOCs have shown that when forums are held within the framework of a mass audience of several tens of thousands of students from different countries, synergistic effects arise that generate high-level innovations. Diversity and the ability to go beyond the limits of one's own professional field is one of the most important conditions for the production of significant innovations. The redundancy of information flows is closely related to the increase in the intensity of social life both in the economy and in politics. The complexity of social and economic systems increases dramatically, approaching the level of organization to highly developed living systems. Speaking about the current situation, B. Gates compares the complexity of economic and social interdependencies with the variety of connections in the nervous system. The presence of super complexity leads to the appearance of synergistic effects that generate instability of the system. Their forecast and analysis of possible development paths, in turn, requires the attraction of significant intellectual resources, which leads to the need for joint analytical and creative activities, accumulating the teachings of scientists and experts of different profiles. The dynamism of the information society requires quick, original solutions. There is a need for innovative initiatives. Innovation as a form of creative activity, generating not just new, but such a phenomenon that leads to a qualitative, radical change in society. First, we are talking about applied science and technology, economics, and politics, since innovation is indirectly associated with practical activities. A feature of innovative approaches is that they qualitatively change the forms of organization, management styles, decision-making algorithms. Since any innovation is based on a fundamentally new idea, in the conditions of information redundancy, there is a need for joint efforts to discuss it, to make expert analysis, and to forecast possible applications. This leads to the demand for new ways of producing,

processing, broadcasting and storing information based on forms of cooperation, which include new network social technologies: blockchain, crowdsourcing, "collective intelligence".

According to Castells [6], informatization and globalization contribute to the formation of a network society. The latter could be understood as a dynamic, self-expanding form of organization of human activity. Due to its properties, information easily penetrates any barriers and boundaries. Knowledge and information circulate in networks representing structures in which relations between people are carried out not only based on economic interests, but also in accordance with accepted norms and rules. The network structure transforms all spheres of social and economic life, which increases the popularity of corporate networks, e-commerce and mobile telephony. The society of network structures is a new public order (organic self-organization), which in the long-term prospective will allow a qualitative change in people's lives.

The modernization of society, its economic, political and social structures requires the search and implementation of new social practices. Social engineering is one of them, and it opens up new possibilities for solving transformation problems. Social technology is an essential mechanism of social engineering. Despite the fact that scientific publications give a different interpretation of this concept, modern researchers in the analysis of social processes, trying to solve social problems and to design and implement communicative influences, are using it. We are talking about technologies such as blockchain [9], crowdsourcing [10], and collective intelligence [11]. Researchers consider these technologies both in terms of the specifics of their application and analysis of the social and philosophical consequences of their use. Today, a professional must be able to apply social technology to solve social problems. At present, society needs fundamental changes in the system of vocational education: while professionals who received education in the twentieth century, as a rule, had enough knowledge for the long-term implementation of work in the specialty. In the modern world [12], the dynamic nature of the information society requires special qualities associated with constant retraining and a kind of reprogramming of a person in accordance with the changing needs of a rapidly growing business environment. Baumann et al. [13] consider modern strategies in the field of education and indicate that education should meet the requirements of the modern dynamic world, market economy and information culture.

A significant restructuring of the entire traditional (classical) education system [12] is happening mainly because the education is no longer considered a privilege of a certain social group or an attribute of a certain age group. People learn throughout their lives. A new educational strategy is emerging and considers lifelong learning. This corresponds to a new approach to education - to learn how to learn. Having considered the results of empirical and theoretical studies conducted by leading scientists, the authors concluded there are some problems that require further development and research. These include determining the specifics of modern technologies of social networks (blockchain, crowdsourcing and collective intelligence), the personal qualities of a professional, justifying the need for new educational strategies and ways to organize training in a university cluster.

The information society as a global network structure is formed at the junction and interaction of networks, including professional ones. Castells defines a network society as a society whose social structure is built around networks that are activated using digitized information and communication technologies based on microelectronics. The network affects a person, subordinating its logic, turning interaction with it into a lifestyle. Unlike industrial and early forms of post-industrial societies, where individual initiative dominates, a modern network society requires the ability to collaborate collectively, which is determined by the needs of the network as a whole. Based on the principle of decentralization, network structures are extremely unstable, and their development has a certain non-linear character.

Research innovations are actively being introduced, taking into account the fact that the proposed ideas and concepts attract other members of the community, and this leads to a kind of competition between them. When the situation becomes unstable, groups may break up. This leads to a state of chaos, with possible fluctuations that can lead the system to a bifurcation point. The latter can reveal fundamentally new levels of problem solving. The non-linear dynamics of the network does not allow accurate forecasts. Competition between networks for survival, by analogy with natural selection, gives an advantage to networks that are able to quickly provide the necessary information or generate new information for a specific task. This poses the problem of overcoming network redundancy. On the one hand, it is necessary to filter out users who generate noise, inefficient information, and on the other hand, to attract active members who are able to create new ideas and innovations.

The ability to attract the most creative professionals to the network is largely based on their trust in the network, on the belief that their ideas will not be used by someone else. Such an approach requires the search for new forms of manifestation, storage and translation of ideas. The success of network interactions largely depends on the degree of trust of network users in it. Trust is an essential need of the information society. A representative example of this is the on-demand deployment of IBM e-business technologies, which offer significant economic benefits. The main idea of an on-demand e-business strategy is the ability to lease information services and technologies. The hosting center can control financial flows and financial statements only if there is confidence in the integrity and transparency of its intentions.

In the context of the coronavirus pandemic, the need to use such technologies for the education system have been clearly manifested. The implementation of the educational process using the Internet, revealed the lack of available information resources, especially for conducting streaming lectures, distributed conferences, and practices in a virtual

environment. The adapted use of business technology on demand in the education system could significantly solve this problem. The need to choose reliable platforms for realizing the goals of effective education in the digital age is one of the most pressing problems of the modern system of higher education [14].

Another popular technology for social networks is blockchain.Free identification, which implies the initial equality of entities entering the system without manifesting their status differences, the availability and transparency of information, its protection from distortion and changes, openness create an enabling environment for interaction based on collective interest, honesty and openness. Blockchain technology is of great importance for "factories of ideas" - platforms that accumulate the creativity of schoolchildren and students.It provides technical protection of information from changes and makes it accessible to the entire network community. Appearing as a technology for using cryptocurrencies [9], the blockchain quickly became popular. The blockchain provides equal access to information when the results of transactions related to debiting or crediting bitcoins to an account are accessible to everyone on the network using this technology, which makes the procedures completely transparent and inaccessible to scammers. The strategic potential of its practical implementation have been gradually recognized in other areas. Storage of all transactions and their availability for business analysis allows us to evaluate the reliability of the company [15]. Databases about the services provided by lawyers, doctors and consultants, and their results allow us to analyze professional competence without reading reviews. Blockchain provides new opportunities for assessing the real significance of scientific innovations, their marketing costs, as well as for assessing the potential effect of their implementation by analyzing the subsequent work of companies buying these innovations. In the education system, one of the pressing problems is the problem of ensuring intellectual property in the latest educational programs and resources. This is especially true of open education. Modern intellectual property systems are not able to protect copyrights, which leads to the fact that original copyrighted methods, educational programs containing significant innovative potential are closed and treated as a trade secret. The introduction of blockchain technologies would stimulate the discovery of innovative educational materials, since it would clearly fix their reuse and receive rewards for it [16]. Blockchain plays a significant role in the identification of students. This is especially important in the context of certification and obtaining documents about education remotely. The identification procedure when using blockchain technologies is greatly simplified; less involvement of forces and technical resources is required, which creates an opportunity for wider use of distance learning technologies [16].

Blockchain technology laid the foundation for the implementation of the principle of trust. Free identification, which implies the initial equality of the parties entering the system without manifesting differences in their status, accessibility and transparency of information, its protection from distortion and changes, publicity, creates a favorable environment for interaction based on collective interests, honesty and openness.

Networking technology can accumulate the creative potential of different people and stimulate the emergence of original and innovative ideas. Crowdsourcing as a technology of a social network creates the conditions for solving non-standard tasks, as a rule, on a voluntary basis, attracting a large number of participants via the Internet without restrictions on their level of education, status, age, etc. One of the pilot projects that unleashed the potential of collaborative research was the SETI @ home (SETI @ home) project, when in 1999 volunteers provided their computers to process signals collected by NASA. The signals were decrypted during the search for extraterrestrial civilizations. Since then, the range of resolved problems has expanded [17]. Crowdsourcing technologies are more widely used in design solutions, joint development of a brand (Citycelebrity), product or content, search for missing people, public opinion polls on the most significant issues, voting, search for innovative approaches to solving problems, etc. Crowdsourcing has a significant impact in areas such as economics, politics, and social life [17]. No less productive is the use of crowdsourcing in the higher education system. The introduction of design teaching methods requires the use of new forms of interactive interaction between the teacher and students [18], creating a competitive environment, which can be effectively implemented using crowdsourcing. Using the project approach to training requires the involvement of significant amounts of information, the development of methods for assessing their relevance and selection of material. The creation of competing mini-groups and the use of crowdsourcing technologies to attract interested parties to the project can increase the efficiency of the process of both collecting material and processing it and putting forward innovative ideas [19].

An avalanche-like increase of the amount information in networks leads to a situation where even in a highly specialized field it is impossible to analyze all significant sources, which requires the creation of advanced expert systems based on collective intelligence technology [20]. The specificity of this technology implies that professionals unite in a global network structure in accordance with the synergetic principles of self-organization for solving specific problems and making collective decisions. Such networks accumulate the generated volume of knowledge and innovative ideas that have been processed by intelligent information systems, as well as by the professionals involved in these networks. The number determines competition between networks and quality of problems solved, which leads to a situation where the most successful professionals are combined into one structure. In such a network, professionals are being ranked by the system itself, depending on their contribution to this network community. Status growth does not depend on external regalia, but on their activity in the network and the effectiveness of problem solving. To expand their

capabilities, such networks will seek to merge with each other, so that ultimately all available knowledge and their carriers will be combined into a single system called collective intelligence.

Competition, individualistic self-promotion of a professional or team is replaced by an awareness of the importance of collective activity as the key to success in the information age [21].

In a higher education system, where the development of research skills and a creative approach is one of the most urgent tasks, the development of work skills in collective intelligence systems is strategically important. The first steps in this direction have already been taken in the domestic education system [22].

The example of China, where universities collaborate with research organizations and leading companies, shows the promise of using crowdsourcing technologies and attracting students to solve non-standard problems even at the training stage. An example of the successful use of crowdsourcing technologies in Russia is the Yandex platform, designed to develop new skills of Alice's virtual voice assistant. The intensification of information flows within networks leads to difficulties in finding significant sources, even in a highly specialized field. In demand are those combining specialists and artificial intelligence technologies. In the research literature, they are called technologies of the "collective mind". Modern network technologies enable professionals to unite in a global-level network structure based on synergetic principles of self-organization. The emergence of such networks makes it possible to combine innovative ideas and the existing knowledge pool into a single system. The use of search engines based on artificial intelligence allows you to quickly structure the available information according to the degree of proximity to the problem being solved. Participation in such networks provides an opportunity for status growth. The system, taking into account the activity in the production of new ideas, the successful solution of problems, the dynamics of the production of innovations according to the degree of complexity, determines the significance of the network participant without regard to the nature of his education, degrees and ranks. A talented and initiative student can acquire a higher status than a professor. Potentially, such networks, in order to strengthen their capabilities, will seek to merge in order to combine all available knowledge and their carriers into a single system called collective intelligence or collective intelligence [11].

According to N. Brockman [20], an increase in the level of collective intelligence will be associated with the processes of the formation of a global culture and the growth of the involvement of educated people in network communities. Social networking and artificial intelligence create opportunities to personalize learning. There is a technological base for creating a personal profile for a student based on a comprehensive analysis by the system of his personality type, psychomotor reactions, past mistakes and achievements. This will lead to the creation of individual educational programs that allow you to go through the learning process at different speeds and at different levels of difficulty. Algorithms are able to capture the student's emotions, side distractions, the perception of the methods used, the degree of attention in the classroom, the speed and quality of answers to questions. Identified gaps in the understanding of certain sections can be compensated by additional homework, the selection of material that helps to increase interest in the studied aspect of the problem. If necessary, the algorithm can give additional recommendations for additional stimulation of the student, recommending him to go to a museum, theater, visit an exhibition or go on a trip. Equally important is the cultural dimension. Despite the intensive globalization processes, the type of culture continues to have a significant impact on the personality type of the student. If American students and entrepreneurs are characterized by pronounced techno-optimism, isolation from reality and a willingness to change the world in accordance with American standards.

The practice of creating networks, accumulating the creativity of students, is becoming very relevant in modern conditions. Society needs radical changes in education. The dynamic nature of the information society requires the special qualities of a professional associated with constant retraining and a kind of reprogramming in accordance with the changing needs of an intensively developing business environment. Hence the urgency of forming the ability of teamwork skills, determining one's own capabilities, developing an algorithm for embedding in creative teams. These skills must be developed starting from the first course of study at a university. The first steps in the Russian system of higher education have already been taken [22].

The need for a fundamental transformation of vocational education in the context of intensive digitalization of society is becoming apparent. In the past, the goal of education was to gain knowledge represented by a complex of verified, reliable and systematized information, perceived as scientific truth within the framework of the corresponding paradigm. However, in a network society, the emphasis is on the possibility of using this or that information to solve a goal within a specific project.

Project-based learning contributes to the acquisition of knowledge, reveals the close connection between theory and practice, and develops the creative potential of students and their communication skills. This approach is aimed not only at vocational training (specialization), but also at the socialization of students, their understanding of the social and humanistic meaning of their future work.

V. CONCLUSION

Using the capabilities of new social network technologies, such as crowdsourcing, blockchain, big date, collective intelligence technologies, and also systems based on artificial intelligence, meets the modern needs of a higher professional education system in the context of intensive digitalization and the development of a network society. At the same time, in Russian higher education institutions there are only a few pilot projects using these technologies. Awareness of their heuristic potential, based on collective

forms of students' creative activity, creation of reliable guarantees for the protection of intellectual property of students and teachers, project modeling of educational and research activities in universities, involvement of a wide range of interested parties in solving problems is necessary.

VI. ACKNOWLEDGMENTS

The work was supported by the Russian State Social University on the results of a study on the "Analysis of the target markets for educational services of the University" individual number Lot 1, order dated April 30, 2020 No. 530, order dated May 26, 2020 No. 593.

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