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Analysis of E-learning in Digital Economy

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***Abstract*—One of the leading trends aimed at solving the contradictions between the developing culture and traditional way of education rights is the transition to a continuous, open education, which forms the basis of the information society. It becomes the basis for e-learning, allowing universities to meet the growing global demand for educational services. Modern education requires the use of new learning technologies. There is a need for information in any location and access at any time. Given the level of development of modern information technology, it is e-learning can provide instant access to information. The world is on the verge of a new, fourth industrial revolution that will lead to fully automate most production processes. Many operations in industry, service, education, and life have already moved to the online environment, and this process gaining momentum. Digital transformation helps not only to follow the trend but also to save time, money and resources, that is, to remain competitive. Today, the educational space is rapidly growing and expanding due to the development of the digital environment: electronic textbooks are being created, educational platforms are emerging and developing, the number of open mass online courses is measured by thousands, and the number of their consumers is millions. Distance education is already firmly established in our lives. The question is: do we have enough high-quality content to fill those "digital powers" that arise. The information society creates new active social and economic sectors growth and the corresponding challenges to educational institutions. This article looks at some trends of using information technologies in e-learning in the digital economy age.**

Keywords—e-learning; digital economy; blockchain; digital environment; distance learning; informatization; availability

I. INTRODUCTION

The global trend of "informatization of life" and education is marked in all key documents of the socio-economic development of Russia. Systemic problems of education are largely due to its lagging behind the information society, the backlog of new technologies. This is especially acute manifested in rural areas, where the chances for school to develop infrastructure are dramatically reduced due to remoteness from the centers. But new technologies are increasingly influencing the changing educational environment. Visualization, virtual reality, cloud computing, artificial intelligence, robotics, nano-engineering, Internet people and Internet things, and many other modern phenomena today are radically and rapidly change the type and structure of education, as well as the system requirements for educational environment. Digital technologies form a new socialization and new inequalities. The most important features of social networks, virtual communication and contacts are speed and independence from geographical location, language and cultural barriers. Education is in transition between its "ICT-free" past and "ICT-oriented" future. This article looks at trends in education in the digital age.

E-learning is the organization of educational activities using information technologies, technical means, including telecommunications networks, providing the necessary information to be transmitted via communication channels, interaction of students and teachers [1]. Such an organization of education is based on the use of information and communication technologies (ICT), such as computer-aided learning technologies, interactive multimedia, web-based learning, online learning, etc. The term "e-learning" replaces the previously widely used term "distance learning". This is due to the fact that the massive use of ICT in educational organizations leads to a blurring of the boundaries between distance learning and traditional education within an educational institution. The integration of distance and contact method of organizing the educational process on the basis of ICT and reflects the term "e-learning". In addition, e-learning techniques make significant changes to generally accepted approaches to the educational process, as well as

predetermine the removal of restrictions and increased access to education.

II. DIGITAL EDUCATIONAL ENVIRONMENT

Informational and educational e-learning environment is a system-organized set of data transmission means, information resources, protocols interaction, hardware-software and organizational-methodical providing oriented education user needs. E-learning is one form of lifelong education, which is designed to ensure the possibility of renewing and replenishing knowledge and skills throughout a person's life — from early childhood to old age [2].

E-learning is: "a set of information technologies that provide the trainees with the main delivery studied material; interactive interaction of trainees and teachers in the learning process; providing students with opportunities independent work on the development of educational material; as well as their assessment knowledge and skills gained in the learning process "; and then it is" a new level of correspondence education, which ensures the use of information technologies based on the use of personal computers, video and audio, space and fiber-optic technology "[3].A number of actions can be attributed to e-learning:

- independent work of students with electronic learning materials, using technical means of training;
- receiving consultations, recommendations, explanations from the consultant (teacher) through remote interaction;
- creation of a geographically distributed community of students in the network (social networks, forums), for joint virtual educational activities;
- timely provision of students with educational information, providing them with electronic educational materials/ It is necessary to include in the e-learning system not only e-textbooks and students' work with them but also educational services and technologies. Then, the e-learning system should include and provide:
- standards and specifications for electronic educational materials and technologies, their development, control, implementation;
- development and popularization of innovative educational technologies using ICT, transferring them to practicing teachers;
- an opportunity to develop and create new electronic resources for educational purposes, to correct already used ones.

E-education provides a number of educational opportunities.

- E-learning allows including in the educational process those categories of the population that, due to age, physical, social, national, regional and geographical features were not able to use traditional educational services.
- E-learning leads to an increased economic efficiency of education. On the one hand, it allows reducing part of the expenses of traditional educational institutions, optimizing and improving the management of the educational process, increasing the level of remuneration of teachers and specialists creating educational resources. On the other hand, for the consumer, financial constraints are reduced, both as a result of lower costs for the training organization and as a result of lower student costs associated with the need to purchase literature, travel, etc.
- E-learning makes it possible to realize an individual learning trajectory in accordance with the cognitive characteristics of the student's personality, his knowledge and available training, availability of training time, material capabilities, etc.
- E-learning can help improve the quality of the learning process. As a rule, the introduction of information technology is accompanied by an increase in the quality of courses and programs of educational institutions, due to the fact that courses and programs are created with the participation of a whole team of specialists. The quality of the educational process can be improved in terms of the presentation of educational materials, pedagogical support for students, etc.
- E-learning contributes to the development of new educational concepts and new teaching models. At the heart of such models and concepts is individual-oriented learning, with a focus on the learner, on his individual characteristics. At the same time, learning becomes active, practical-oriented.
- E-learning opens up the possibility of transition to an open model of education, allows implementing the concept of continuing education. The growth of the educational level of the individual over the course of a lifetime is a social need, especially in connection with the task of compensating for lost functions and opportunities.
- E-learning allows all participants in the educational process to develop in accordance with the requirements of the time. Both teachers and students in the e-learning system develop their knowledge and skills in accordance with the latest technologies and standards. In addition, the use of electronic technologies allows you to quickly update the content of educational materials and promptly update the form.

III. THE AVAILABILITY OF E-LEARNING

The availability of e-learning is one of its main advantages. Since the appearance of the first universities, sages, professionals whose knowledge was in demand, the main limitation was their accessibility — first of all, financial and territorial. The number of students always exceeds the number of teachers. The newest technologies will increase the accessibility of education for any population

groups. In addition, the form of interaction through the means of teamwork will be actively developed — the so-called “co-working” spaces will move to the virtual world, where, besides the training “teacher-student”, it is quite possible to study “student-student”. After all, it is not a secret that today many professionals who increase their competence are able to act as experts themselves on individual issues.

A person often acts at the same time as a consumer and a producer of the products of his labor, including the “educational service”, when he independently creates goods, services, and experience for his own use or pleasure. In economics, such behavior of an individual is characterized as “prosumerism” (prosumption) [4] — “demand” or “production”, a neologism introduced by Alvin Toffler, in which the PROduction merges with CONSUMPTION. Toffler, as an ideologue of post-industrial society, assigns the pre-consumer a key role in the intellectual revolution and changing the type of society in which the boundaries between the producer (seller) of a product or service and the consumer (buyer) are erased, and the pre-consumer can independently satisfy all his needs [5].

The concept of “pre-emption” provides a scientific justification for human activity in the “do it yourself” mode, or “do it yourself” — DIY, when individuals or groups of people — makers (from the English maker) — create, modify or repair things or teach each other various competencies personally or remotely, without seeking direct assistance from experts or professionals. DIY behavior can be caused both by market motives (economic benefits, lack of goods and services, poor product quality, the need for customization/personalization) and personal ones (skill, empowerment, community membership, uniqueness) [6, 7].

Already, employers are paying attention primarily to a set of competencies, and not to diploma marks, taking on distance work of specialists from different countries and continents. These employees will work in digital factories — "factories of the future." And no matter where they are these specialists, what are their physical capabilities [8].

IV. Advantages and Disadvantages of E-learning

In general, the main advantages of e-learning are:

- Greater freedom of access — the student has the ability to access, via the Internet, e-courses from any place where there is access to the global information network.
- Competent, high-quality education — courses are created with the participation of a whole team of specialists, which makes e-Learning a mature and high-quality training.
- Lower prices for the delivery of education — in e-learning, the delivery of education includes only the exchange of information via the Internet without the cost of the student for the purchase of educational materials.
- The possibility of separating the content of the electronic course into modules — small blocks of information allow you to make the study of the subject more flexible and simplify the search for the necessary materials.
- The flexibility of training — the duration and sequence of studying materials the listener chooses himself, fully adopting the entire learning process to fit his capabilities and needs.
- The possibility of learning in the workplace — students have the opportunity to receive an education without leaving work (if any), as well as at home, on the road using the mobile Internet.
- The opportunity to develop in tune with the times — users of electronic courses: both teachers and students develop their skills and knowledge in accordance with the latest modern technologies and standards. Electronic courses also allow for timely and prompt updating of training materials.
- Ability to determine the criteria for the assessment of knowledge — in e-learning there is an opportunity to set clear criteria by which the knowledge gained by the student in the learning process is assessed.

The listed advantages of e-learning are assessed in Russia. The leader of the movement of Russian universities to e-learning is the Moscow State University of Economics, Statistics, and Informatics (MESI). MESI together with a number of universities in Russia and abroad, also actively practicing the implementation of e-Learning in the educational process, created a consortium "Electronic University". Currently, a unique project has been developed on the Internet that gives anyone the opportunity to acquire or improve their IT knowledge — the Internet University of Information Technologies (INTUIT). The leader among educational Internet programs for schoolchildren is two projects: “Open College” (www.college.ru) and “Cyril and Methodius Virtual School” (vschool.km.ru). Both projects are developed by the creators of the training programs on CDs. These programs in the “trial mode” are also offered on the Internet.

However, it should be noted that with all the listed advantages of e-learning “for all”, a number of problems remain. These include the problem of the quality of e-courses (who can evaluate them and how), legal problems related to the protection of intellectual property, financial ones related to the costs of preparing e-courses, their updating, personnel problems related to the training of teachers who are able and willing to develop and constantly update such courses [9].

Of course, the teacher, using e-learning technology, can reach a larger number of students, geographically dispersed, but will it bring the desired educational and economic effect? In the traditional face-to-face learning process, the teacher has the necessary feedback for learning immediately, reacts to it, “on the go” rebuilding the learning material, has the ability to make this material more accessible before the students' eyes. Of course, for the preparation of electronic courses, the experience of expert teachers, asses in their field

should be used, but such a teacher does not always have the necessary time for this, the ability to work with a computer.

V. E-LEARNING IS A STEP INTO THE FUTURE

A fully virtual learning experience is still a minority choice, and most of these courses are provided by specialized institutions, such as the Open University of Great Britain and the Netherlands or the University of Phoenix in the USA. Institutions of this kind currently compete with more traditional universities and colleges for a place in the market for educational services, and this influences the way all educational institutions treat their students and potential students in their circles. For example, the Open University of Great Britain has provided most of the course content in the public domain and encourages everyone to participate in the learning process as much as possible, such as watching a television documentary, ordering a poster, downloading a podcast, viewing the course materials, discussing them with other students, participating in mass open online course or finally signing up for a fully online course. This position reflects both the marketing strategy and the public expression of the mission and values of the educational institution.

Finally, the students themselves change [10]. Most young people in western countries regularly use the Internet and e-mail, text messaging and social software, file-sharing sites, Cloud services, and mobile devices [11]. Their acquaintance with these new forms of information exchange is transferred to their training. Besides the fact that their school or training course requires the use of technology, students also use communication and information tools that help them manage their learning process. Indeed, some curriculum transformation projects have shown that more progress can be made by allowing students to choose their own learning technologies.

VI. E-LEARNING AND BLOCKCHAIN

Blockchain enables all of humanity to optimize the most diverse spheres of life [12]. One of the advantages of this technology is that it is almost impossible to hack and there is no need to attract third parties. The whole principle of the block-circuit is based on mathematics and cryptography [13]. Over time, the blockchain will infiltrate all areas of activity, including education. Currently, there are a number of problems in education. One of the important problems is fraud in the field of falsification of documents and the problem of security of documents. At the present time, there have been frequent cases when a person, not studying in a university, simply buys a diploma and can work with him. Unfortunately, these cases are not unique. Companies hiring new employees often have difficulty validating documents. The head of Machine Learning, Chris Jagers, is convinced that the blockchain is able to simplify the process of verifying educational data that is being used throughout the world. The story is a case where the former head of Yahoo filed fake documents about graduating from an educational institution in Stonehill. Many then condemned the personnel department of the company for not properly verifying their director. The only method of such verification could be only sending a request to an educational institution. If a company handles a similar request, then it takes up to two weeks for them to begin to consider the request and the same amount of time to receive a response. This will not cause inconvenience for small companies, but it is absolutely unsuitable for such giants as Yahoo, who each year take in a host of workers in hundreds of structures.

In order to study this important problem, employees of the Massachusetts Institute of Technology (MIT) conducted a study and demonstrated how to record data about the presence of an educational document in the blockchain cryptocurrency Bitcoin and manage them. To do this, they use one of the functions of the Bitcoin blockchain, which is called OP_RETURN and allows you to record additional information in each transaction. MIT offers to calculate the hash of the document using SHA256 and attach it to the transaction, complementing its encrypted signature. After five confirmations on the blockchain, this certificate remains permanently available in the system. Philip Schmidt from the MIT Media Lab believes that the use of blockchain technology and high-quality encryption can help create a perfect system for monitoring educational achievements. The employer will receive a resume in electronic form and can be confident in its accuracy.

MIT does not hide their technology from the public and try to popularize it. However, the OP_RETURN function is not very suitable for solving this problem, because the amount of data that can be stored is strictly limited. Using this method is quite expensive and inefficient when it comes to a large number of documents. Researchers from MIT decided to go ahead and started working with Machine Learning on a project called Blockcerts. This project will also be based on the blockchain of the most popular crypto-currency to write there protected certificates, which are protected from unregulated use, but with one significant difference. It will be in the approach to the publication of the certificate. The graduate must first send the public key to his school, which uses his key to hash the document and writes it into the blockchain. Thus, anyone can verify the authenticity of the certificate in the future.

Jagers says that now there is no more comprehensive service to solve this problem than this open standard. It includes everything you need to create and verify blockchain-compatible documents. MIT and Machine Learning immediately found support for their Blockcerts project through the Art School of Chicago, Yale and Stanford Universities. However, it was not only the best universities in the USA that were interested in using the blockchain. Similar initiatives, but within other projects, are also found in Europe. The first institution that officially approved the use of the blockchain for storing documents was the University of Nicosia. Moreover, this is the first educational institution, which began to accept payment in Bitcoins. This university also provides open online courses in 83 countries. And his diplomas are recognized worldwide thanks to the European Association of Universities.

The use cases of the blockchain by the education system are not limited to storing documents in the database. All the advantages of this technology can radically change the

education system, for example, contribute to online learning. The prevalence of online courses is constantly increasing because they are cheaper and allow you to get knowledge from any place in the world where there is the Internet. And if you combine different courses in blocks, you can develop areas of training in many narrowly focused specialties. In addition to all this, standards should be developed for the blockchain that will allow recognition of any diplomas and certificates anywhere in the world [14].

VII. CONCLUSION

Thus, the above shows that e-learning is a method applicable (and already used) within the framework of traditional educational forms. However, e-learning allows create a new form of education — distance education, which is a synthetic, integral, humanistic form training based on a wide range of traditional and new information technologies and their technical means that used to deliver educational material, its independent study, the organization of dialogue exchange between the teacher and students, when the learning process is not critical to their location in space and in time, as well as to a specific educational institution.

Today it is obvious that e-learning is not a temporary hobby, but today we need to take care of a comprehensive solution of these problems, create an inter-university Center for assessing the quality of e-courses, train teachers, draw the attention of companies operating in the information technology market to problems of integrated information universities.

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