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# Education and Science in the Information Age

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**Abstract.** The article considers the changes that took place during the transition from industrial to information society. The main achievements of the information society, in particular the development of IT and their capabilities in the field of communication are considered. Attention is drawn to the fact that in the context of globalization the achievement of IT is an extremely great breakthrough, they allow to overcome time and space, contribute to the development of science and education. The created virtual world, which emerged thanks to the Internet as one of the phenomena of the information society, became a condition for the formation of collective action of social groups, including scientific, because this phenomenon gave scientists another opportunity to conduct research, experiments etc. In the course of the research such methods were used as: historical, comparative, analytical, dialectical and culturological. Each of these methods contributed to the implementation of the tasks, and in its totality and interaction – to achieve the goal of the study. It led to the following conclusions that IT creates a new opportunity for communication, it differs from the previous era in its impact on people's lives, given the institutional and cultural approaches. Thanks to the development of science, the economy is changing – it is becoming more flexible, growing. Scientists, overcoming temporal and spatial boundaries, have the opportunity to respond quickly to the challenges of time, to conduct research, discoveries, to unite in various scientific societies. Using social Internet networks, resorting to new opportunities to work in the virtual world, conducting a variety of research without harming man, society and nature, modern science goes to another level. And depending on the economic development of the country and the development of science.

## INTRODUCTION

The beginning of the 21st century in social development was marked by radical changes associated with the invention of the Internet. It is the Internet as a phenomenon of scientific and technological progress that has created many opportunities for the development of science, expanded the possibilities of human cognition and so on. The era in which the development and formation of personality, according to some researchers, namely: D. Bell and A. Toffler, was called information. L. Ryzhko's opinion pushes us to such a conclusion, with which it is difficult to disagree: "Industrial society has intensively expanded the living space of people by capturing suitable for human life space of nature and excessive expansion of the constructed space, it is a feature of the information society... space of knowledge (cognitive), especially science" [5]. This indicates that modern society is a society of science, which is characterized by creativity, because science is also creativity, but specific, based on relevant laws, methodologies and has its own system, which is dynamic and corresponds to the possibilities and features of the era. According to G.

Utkina, there are two approaches to understanding the concept of “science” – transcendental-analytical and immanent-philosophical. Regarding the first, science is a specific structure of consciousness in its cognitive and cognitive-procedural certainty; for the second, it is the answer to the question: how such a structure of consciousness in terms of general characteristics of consciousness is possible [6]. As we can see, both the first and the second approaches reflect the activity that is not a simple mechanical transformation, but is presented as a result of conscious action, which is impossible without a creative approach with logical and consistent actions aimed at achieving the goal.

This is confirmed by the study of T. Kuhn. In his opinion, science becomes the work of research teams, scientific communities, which are formed on the basis of a common paradigm [3].

The above helps to formulate the purpose of the study: to consider the peculiarities of the development of science and education in the information society.

Objectives: 1) to analyze the features of the information society; 2) determine the impact of IT on the development of science, education; 3) show the Internet as an opportunity for scientific activity.

## METHODS

The following methods were used in the research process: historical, comparative, analytical, dialectical and culturological. Each of these methods contributed to the implementation of the objectives, and in its entirety and interaction – to achieve the goal of the study.

## RESULTS

Speaking about the development of science, it can be noted that the scientific and technological progress that we observe in the field of information and communication technologies and which influenced the next stage of development, provided greater opportunities for the development of science. Using the Internet and information and communication technologies, scientists have the opportunity, especially when it comes to natural research, to model their research, discuss it in social networks and scientific forums, which expands the circle of stakeholders, saves time, quickly overcomes space and more. Practically, scientists, working on research, combine two worlds: real and virtual. The appearance of the latter is facilitated by the computerization of everyday life. With the help of virtual reality technologies, simulations are created – a virtual analogue of real social interaction.

To confirm the confirmation of this hypothesis, we conducted a survey in two stages of research and teaching staff of Khmelnytsky Humanitarian-Pedagogical Academy:

<b>During the COVID-19 pandemic</b>						
Number of respondents	Use of virtual space in its work, in %	The purpose of using, in %				Does the level of development of science, economy affect the size and effectiveness of the scientific community represented in the virtual world of social networks, in %
		As additional Opportunities for information	For self-education	For scientific cooperation in order to promote their achievements	To participate in international projects	
120	68,3	58	41	32	12	62,1

  

<b>During the Russian Aggression</b>						
Number of respondents	Use of virtual space in its work, in %	The purpose of using, in %				Does the level of development of science, economy affect the size and effectiveness of the scientific community represented in the virtual world of social networks, in %
		As additional opportunities for information	For self-education	For scientific cooperation in order to promote their achievements	To participate in international projects	
120	81,2	79,1	80	41	12	73,3

**FIGURE 1.** A survey of research and teaching staff of Khmelnytsky humanitarian-pedagogical academy

It should also be remembered that the strategy for the development of society was discussed at the XVIII session of the General Conference of UNESCO, where “Recommendations of the Scientists Status” were adopted. Analyzing these recommendations, we can conclude that the development strategies of society are necessarily accompanied by the development of human resources. However, this is impossible without the development of science, which must fully meet the requirements of the information society. As we can see, there is a direct interdependence of the science development and the society development. Continuing this view, we note that the Okinawa Charter, adopted on July 22, 2000, addressing the social responsibility of scientists at the global level, divides it into two types: on the one hand, the scientist is responsible to humanity for his discoveries, research, and on the other, collective responsibility, i.e. the implementation of these results in life, in the country and in the world.

It should be noted that in the industrial society, which was a prerequisite for information one, man was seen as a being who has a relatively stable set of knowledge, skills and abilities necessary for professional activity, and in modern conditions in the information society there is a need for a person capable of education. throughout life, self-education and self-organization in accordance with social needs, which are in the process of constant change. This feature is due to the possibilities of information and communication technologies and as a means of production in the information age. Thanks to these technologies, science has got rid of spatial, temporal and ideological limitations.

Assigning such a role to information and communication technologies of the information society is of great importance, because in the globalized world, thanks to them, science and education play the role of diplomacy, in particular, we can talk about scientific and educational diplomacy. Peculiarities of this diplomacy are revealed in the work of O. Polishchuk, O. Kivliuk, D. Svyridenko, O. Yatsenko [8], however, only one of its components – educational one. However, we also understand that education and science are not the same thing, but in real life they interdependent, which helps to demonstrate Ukraine in the world with the help of intellectual potential. Science cannot develop outside of education, because the latter contributes to the formation of man in science. Using a linear approach, a person, overcoming various stages of life, approaches science. At the same time, an important role is given to freedom, which gives a person the opportunity to choose, determine, create. Practically with the help of science man changes the world, improves matter. Based on this and the analysis of various scientific and journalistic sources, we can say that this is a special form of knowledge that allows you to learn as deeply as possible about the world, its laws and at the same time simplify human life. However, science, as a sphere of employment, is not peculiar to all people, but only to a certain group, which has developed special thinking and which with the help of special means carry out scientific research, discoveries, rethink existing, work on “mistakes”. Taking the peculiarities of scientific research into account, we can conclude that they are common in origin, development and use. In this sense, science appears not only as a sphere of activity of a separate group of people, but as a value that unites like-minded people and becomes a value condition for the formation of collective action. That is, any scientific discovery is not the result of the activities of only one person, but usually two or more

Considering the development of science in the information society, where the Internet and the social networks that exist in the virtual world dominate, we can conclude that modern science is becoming a research collaboration between scientists from different countries, which can be joined by anyone as an atomized subject of cyberspace. The most important thing is that these subjects meet certain requirements – the requirements of science. In this context, the work of T. Kuhn is interesting, who notes that “the scientific community consists of specialists in a particular field who received similar education and professional skills, mastered the same educational literature and were responsible for achieving certain goals, including training disciples and followers. These goals are of different nature in the period of normal science and in periods of scientific revolutions” [3].

Such cooperation does not have to be considered within the state, such a vision is superficial, because any scientist has the opportunity to work with real people, people of his time, and with materials of historical value to science, and therefore with people “scientific problems of time”. In this way, the formation of scientific collective action outside the territorial space and time take place and this is facilitated by scientific discoveries in the field of information and communication technologies, and education and science itself plays the role of diplomacy.

The age of the Internet and the technologies based on it are technologies of new opportunities and freedom. In today’s globalized world, the economy depends on the Internet, and being disconnected from those networks means being thrown out of today’s realities.

Thus, educational and scientific diplomacy is a specific system of relations based on intellectual activity, its popularization. Education and science are changing their face from a simple social institution, a social system that provided socialization aspects, they began to provide the economic component of society. Analyzing the development trends of modern society in Ukraine and in other countries, we can say that the information explosion that took place in the world, launched new areas of research related to biotechnology, robotics, automated systems and more. All this contributes to the formation of the global economy. Its peculiarity, according to M. Castells, is nothing more than the

interaction between markets, governments and international financial institutions [2]. These industries are the most profitable. Taking into account the demand for specialists in the field, back in 2008 V. Onuprienko and M. Onuprienko noted that among domestic scientists there are those who stay at home in their institutes, work for foreign research centers and companies, joining the international Internet communication. This process is increasingly replacing the notorious “brain drain”, about which there are many disturbing maxims, but is much larger. Working on domestic obsolete scientific equipment, these scientists, however, obtain results that will satisfy Western producers, passing them directly to customers [4]. In recent years, this situation is only deepening and this can be seen in the examples of the development of space, medical industry, where among the group of foreign scientists, researchers are scientists from Ukraine. However, there is another side of this situation, when domestic science to some extent plays the role of a raw material appendage in the scientific world. However, this situation is not stable and with each stage of development of society changes and the corresponding situation in science and education.

Today, our scientists have the opportunity and honor to participate in international conferences, symposiums, seminars, etc., to promote their scientific achievements in foreign, scientometric publications, to join various scientific chats, conduct opinion polls and more. Such radical changes in the field of communication give impetus to the expansion of collective action of social groups based on common scientific interests, the result of which is the implementation of scientific achievements in the curriculum. Analyzing scientific achievements, we can divide them into two groups: social sciences and natural sciences, such a division existed in ancient times, but had some conventionality, but with each stage of human development, society and science, such a division is constantly crystallized that gives grounds to adhere to it in the modern world. Speaking of science, it is worth noting that it must be focused on rationalism and praxeologism, and this is evidenced today by scientific discoveries in the field of natural sciences. After all, the modern material world is filled with robotics and nanotechnology, which facilitate human life and radically change its existence.

Regarding education, it should be noted that the period of informatization has created considerable opportunities for participants in the educational process in learning about the world and communication. In the conditions of communicative and technical progress, pandemic, and today military actions on the territory of Ukraine, education is forced to pass from real audience to virtual. Participants in the educational process receive scientific knowledge not only from teachers, but also through the use of various sites and social networks. The situation in which a person finds himself also influences on being in the virtual world. According to their mood, needs and aspirations, humanity is spending more and more time in the virtual world. However, such an absorption has not only positive but also negative aspects, in particular it is related to the reliability of certain information that a person obtains through the Internet. Another threat is the reluctance of a person to search and analyze this or that information, and using the capabilities of social networks, and the Internet space, this person becomes a consumer. The question of thinking and the possibility of cognition is practically raised. But this is if we abstract only from the possibilities of the Internet in the cognitive process and receiving educational services.

## DISCUSSION

Issues related to the Internet, social networks and their development and conditions in the era of information society and globalization are extremely interesting and relevant. Especially based on the opportunities that are created and those that they provide, looking at them through the prism of the economy, globalization, comfort and human desire for the better. Based on this, we note that these and other issues were considered and are considered in the framework of the UNESCO international organization, as well as leading experts: M. Castells in his works “Information Society”, “Network Society”, “Globalization”, “The Information Age”, “The Internet Galaxy”, and “The Power of Communication” examines the history of the Internet, the cultural processes that take place around it etc. All his works are based on the study of the views evolution on this phenomenon. The author tries to understand the communication capabilities of this phenomenon, its impact on economic development and more. Researchers such as V. Zinchenko in the work “Globalization and Globalism” considers the development of science, education in the context of globalization processes, as well as their impact on economic development [1], M. Heim, considering the virtual world and its possibilities, noted that the creative achievements created with the help of virtual reality are one of the most important intellectual resources that ensure the well-being of mankind in the information age [7].

## CONCLUSIONS

According to the results of relevant materials analysis we can claim that in the information society, thanks to IT, a new form of human interaction has been formed – networking, which in the era of globalization is becoming global. It differs from the previous era in its impact on people’s lives, taking into account the institutional and cultural approaches. Features of the information age create new opportunities for the development of science and quality educational services. Thanks to these discoveries and achievements of society, the economy is changing – it is becoming more flexible, increasing the productivity of all subjects, creating new conditions for the development of science. Scientists, overcoming temporal and spatial boundaries, have the opportunity to respond quickly to the challenges of time, to conduct research, discoveries, to unite in various scientific societies. Using social Internet networks, resorting to new opportunities to work in the virtual world, conducting a variety of research without harming man, society and nature, modern science goes to another level. And depending on the economic development of the country and the development of science. We can claim that the achievements of the 21st century created new conditions for the development of science and education, which, in turn, contributes to the formation of collective action of scientists in a new format.

Another feature of the use of information and communication technologies is the value orientation of scientists. It should be noted that we did not consider this problem in terms of specialties, as we did not envisage such a goal. Our task was to establish the dynamics and practicality of the use of the Internet in the scientific activities of subjects of science and education from the position of a scientist. From a practical point of view, the Internet and the conditions it creates are a favorable platform for the development of science.

## REFERENCES

1. V. V. Zinchenko, *Globalization and globalism* ("New World-2020", Lviv, 2014).
2. M. Castells, *Information age. Economy, society, culture* (Publishing House SU-HSE, Moscow, 2000).
3. T. Kuhn, *The Structure of Scientific Revolutions* (Port-Royal, Kyiv, 2001).
4. V. Onuprienko and M. Onuprienko, *Bulletin of the National Academy of Sciences of Ukraine* **1**, 63-66 (2008).
5. L. V. Ryzhko, *Scientific space: philosophical and scientific aspects* (H. M. Dobrov Research Center of Scientific-Technical Potential and Basic Science, National Academy of Sciences of Ukraine, Kyiv, 2000).
6. G. Utkina, *Problems of economic theory* **4**, 65-69 (2014).
7. M. Heim, *The Metaphysics of Virtual Reality* (Oxford University Press, New York, 1993).
8. O. Polishchuk, O. Kyvliuk, D. Svyrydenko and O. Yatsenko, *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytety* **3**, 139-144 (2018).
9. L. Botin, B. de Boer and T. Børsen, *Techné: Research in Philosophy and Technology* **24:1-2**, 1-14 (2020).
10. M. Gawdat, *Scary Smart: The Future of Artificial Intelligence and How You Can Save Our World* (Pan Macmillan, 2021).
11. P.-P. Verbeek, *Philosophy of Engineering and Technology* **33**, 141-155 (2020).
12. V. Zinchenko, "Informational technologies as an integrative component of the sustainable development goals and global cooperation strategy in research activities of education systems", in *AIP Conference Proceedings* **2656** (2022), 020027. <https://doi.org/10.1063/5.0106366>