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The role and use of Information technology in higher education

Nowadays, one of the main priorities of Ukraine is „the striving to build Information society in focuses on the interests of people, opened for everyone and directed on the development of Information society where everyone could create and collect information and knowledge, have free access to them, use and change them, to enable everyone to realize his potential, promoting social and individual development and improving the quality of life. The importance of information cannot be overestimated. It contributes to the national interests, increases productivity, improves literacy, provides development of intellectual potential of the nation and improve the social and economic relations, enrich spiritual life and further democratization of society, the culture of communication” [*Strategy* 2011].

According to article 1 of the law of Ukraine „About the National Program of Informatization”, it is a „set of interrelated political, social, economic, scientific, and industrial processes aimed at creating conditions to meet the information needs of society through the creation, development and use of information systems, networks, resources, and information technology” [Закон України 1998].

Since the information society tends to create the „hybrid integrated intelligence of civilization that can anticipate and manage the development of mankind” [*Современные* 2012], the important contribution to this process should be done by education. Training highly qualified personnel capable of developing new information technologies and using them effectively in their professional activities is a task of strategic importance. Informatization of education is a key prerequisite to the successful human resource development because the working conditions have been greatly changing and require new skills and abilities. The workplaces have become automated, and we have to navigate the vast amounts of information that comes continuously. We must ensure that our students are suitably prepared for a lifetime of technological change.

Strategic goal of Ukraine is entering the global information society as its full member, while maintaining political independence, national identity and cultural traditions. The Ukraine's accession to the European Higher Education Area requires the implementation of certain reforms. Improving the quality of education through the implementation of modern information and communication technologies is one of the important steps in this direction.

The main lines of the development of information technology in education are ensuring the computer and information literacy; providing easy access to global information resources and learning from anywhere at any time; popularizing the best practices of the personalized learning; integration of academic, research and industrial activities; enhancing learning motivation, and developing creative thinking.

The aim of the educational process should not be just development of the ability to work with certain software tools and technology. The ability to process and analyze different kinds of data – text, audio and video, graphics, and so on – is the main goal of the implementation of information technology in education. It is important that educational software is not turned on the analogues of existing textbooks. The use of technology is especially appropriate in case of the phenomena that cannot be studied by visual research.

At the beginning, the major principle of using computers was the focus on those cases where the teacher could not complete the task with the help of the traditional pedagogical aids, for example, demonstration of some of the physical processes. Modern students cannot imagine teaching without computers. It helps develop creativity and logical thinking, promotes professionally important skills.

To determine the role of new technologies in the educational process, it is very important to understand the nature of knowledge. It is a different type of knowledge, because it is more dynamic synthesis of nearly all spheres of it. The goal is not to memorize the information but to be able to quickly and easily navigate it. Nowadays, more and more attention is given to distance education. The paradigm of education is changing from „education for life” to „lifelong learning”.

The International Foundation for Information Technology (IF4IT) defines information technology as one „used for the study, understanding, planning, design, construction, testing, distribution, support and operations of software, computers and computer related systems that exist for the purpose of Data, Information and Knowledge processing” [IF4IT 2012]. Using information technology in education provides:

- a great variety of educational resources;
- fast access to authentic and relevant information;
- opportunity to use the resources of the world libraries;
- opportunity to study at any convenient for the user time in any place;
- access to education for disabled people or those who are unable to attend traditional schools for some reason;
- individual approach to learning; taking into account the level of knowledge of the trainee;
- opportunity to join students from different countries for collaborative learning;
- multimedia approach to education;

- unlimited opportunities for increasing motivation for learning;
- education data storage;
- a variety of communication channels like e-mail, forum, blog, chat etc.;
- access to the free computer and IT training software;
- ease of complicated tasks;
- saving time;
- significant improvement of task performance.

Information technology can be divided into two main interrelated groups: basic and applied. The first group includes multimedia and telecommunications technology; technology of artificial intelligence and expert systems; CASE-technology; database technology; information security; software engineering; image processing; speech recognition; modeling of technological and other processes; network engineering; technology of storage and processing of very large volumes of information etc. Multimedia becomes of particular importance in education. It provides association of multidimensional information environment (text, audio, graphics, photos, and video) in a uniform digital representation; reliable (with no distortions in the process of copying) and durable (warranty period is ten years) storage of large amounts of information; and ease of information processing (from routine to creative operations).

Applied (functional) information technology, which is a modification of the base technology for a particular subject area, includes systems of process control in real time, quality control technology, machine translation technology etc. The major areas of multimedia technology in education are:

- electronic editions;
- information superhighway as a global network of high speed transmission of digital data, voice and video through satellite, cable and fiber-optic communication lines (telecommunications);
- multimedia information systems that give visual information at the request of the user.

Multimedia applications include: presentation (linear, interactive, slide, production); animation (frame by frame or programmable); educational games; videos and video players; Multimedia Gallery (change of images frame by frame, panorama, interactive gallery); audio files players (digital sound); Web programs (banner, transfer data application).

Effective integration of information and teaching technologies allows shifting the emphasis in teaching from the traditional to the active learning, in which a computer is a means of thinking, developing cognitive abilities and communication skills.

It is also impossible to imagine modern education without technologies like hypertext and hypermedia. Hypertext technology is a creation, maintenance, extension and revision of the text presented in a network. Programs that support

this technology are based on four features of hypertext: (1) replacement (while viewing the text, you can replace any part of the information by an image or any other piece of the text); (2) links (you can use links of information network); (3) notes (like standard notes in the margin, but by expressive means of video, color, graphics or sound); (4) requests (text analysis from the specific position).

An important step in applying information technology in education was the introduction of Web 2.0, enabling everyone to create and publish content online, including: video on YouTube, photos on Flickr, blog posts, social networking, wiki projects and more. The key components for Web 2.0 is easy to use tools and social interaction with expected results. An important result of Web 2.0 is the so-called „collective mind” – the ability to search and sharing knowledge with users and experts from around the world.

Web becomes a computer platform that provides software as a service (Cloud Technology or Cloud Computing). National Institute of Standards and Technology (NIST) defines cloud computing as a „model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics (on-demand self-service, broad network access, resource pooling, rapid elasticity, measured service), three service models (SaaS, PaaS, IaaS) and four deployment models (private, community, public and hybrid clouds)”. The other models are DaaS (Data as a Service), HaaS (Hardware as a Service), WaaS (Workplace as a Service), SaaS (Security as a Service), AaaS (All as a Service).

Cloud computing is a paradigm, in which information is permanently stored in servers on the Internet and cached temporarily on the client side, such as personal computers, game consoles, laptops, smartphones etc.

Modern education can be called network education. To ensure its global and outpacing nature, the enormous possibilities of computer networks able to combine information resources of mankind by providing instant communication with anyone around the world are used. Members of the educational process are able to use online tutorials and world libraries materials; participate in teleconferences to study in virtual classrooms; use email; exchange graphic materials etc.

Intelligent Information Systems are also widely used in education. They can be defined as the next generation of Information System (IS). Expert (or knowledge based) systems are a subclass of intelligent systems. Application of expert systems in education provides intellectualization of educational activities; training specialists able to work effectively in a modern information society; developing the personality whose level of intelligence will always exceeds the level of artificial intelligence.

The implementation of educational expert systems makes possible new kinds of learning activities such as interactive dialogue, control of real objects

and displayed models of various objects, phenomena and processes. Computer-aided control, self-control and correction of the results allows to create methodology focused on the development of thinking, assists in developing of communication skills and ability to make optimal decision and offer options in difficult situations.

Expert systems in education increase the probability, frequency, and consistency of making good decisions; help distribute human expertise; facilitate real-time, low-cost expert-level decisions by the no expert; enhance the utilization of most of the available data; permit objectivity by weighing evidence without bias and without regard for the user's personal and emotional reactions; permit dynamism through modularity of structure; free up the mind and time of the human expert to enable him or her to concentrate on more creative activities; encourage investigations into the subtle areas of a problem; give emphasis on individual student by keeping record of his or her learning ability and speed; provide convenient environment to ask queries and find out their solutions; give a congenial way to find out errors and fix them.

The most common communication technologies in computer networks, which provide operational communications, storage and exchange of information messages of any content such as text documents, audio and video files, archives, programs etc., is the E-mail. It is used for communication between members of the educational process, transfer of teaching materials, etc. The advantage of this technology is an asynchronous exchange of information. Mailing list (LISTSERV) makes it possible to send one email to the list, and then transparently send it on to the addresses of the subscribers to the list.

Efficiency of education informatization depends on the efficiency of the processes of creation and use of information resources. Information resources are a combination of information about past and current experience of mankind. They can be divided into personal information, social memory of human communities, and operational information that continually arises in the process of the human's reflection, perception and awareness of everything that is happening around.

Today, popular sources of information are the social networks and blogs. They are consistently included in students' lives. However, the growth of educational online resources far exceeds the teachers' capability to evaluate and systematize them. It leads to their chaotic and ineffective use.

The concept of „social network” appeared as early as in the mid-1990s, and had no relation to the Internet. Now the most popular is social networking online. There are different types of social networks. According to their availability, they can be divided into open (Facebook), closed (PlayboyU) and mixed (VK). It can be personal communication (Classmates.com), business communication (LinkedIn), entertainment (MySpace), video (YouTube), audio (Last.fm), photos (Flickr), geographical location (Foursquare), shopping (Groupon), blog-

ging (Tumblr), news (Reddit), question and answer (Answers.com), bookmarks (Delicious), virtual worlds (Second Life), thematic (Slashdot) etc. Educational (Scribbler) and research (Academia.edu, Epernicus.com, LinkedIN, Nature Network Mendeley.com, MyExperiment.org, Researchgate.net, SciPeople, Scispace.net et al.) social networks are of particular importance in education.

Informatization of education is a key prerequisite to the successful human resource development. Ability to use information technology in the professional activities is of vital importance since the working conditions have been greatly changing recently.

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Abstract

The aim of the article is to study the role of information technology in the educational process. Two main interrelated groups of information technology (basic and applied) are described. Using the Web 2.0, cloud computing, educational expert systems, multimedia applications, hypertext, hypermedia, E-mail, and social networks are considered.

Key words: higher education, informatization, information technology.