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INFORMATION TECHNOLOGIES: CONCEPTS, TYPES AND FUNCTIONS

The article analyzes the concepts of «information» and «information technologies», since today the issues of development and improvement of information technologies are particularly relevant. This state of affairs requires a thorough understanding of basic concepts. The article states that information technologies represent a set of methods and ways of obtaining, processing and providing information in the interests of various users and consumers. In the modern conditions of the functioning of society and the state, information technologies are an effective tool for improving management processes in various spheres.

It was emphasized that modern information technologies require the ability to competently work with information and information systems. In addition, the implementation of the specified works requires orientation in the types of information technologies. The main types of information technologies are summarized: information technologies of data processing; management information technologies; information technologies of the automated office; information technologies of expert systems.

The functions of information and information technologies performed by one or another type of information technology are highlighted. This will only help in working with information technology, which does not require complex preparation, large costs and complex equipment.

It has been established that information technologies occupy an important place in the life of a modern person. Today, there are practically no areas in which information technologies are not used. It has been

proven that the active development of information technologies and their implementation have increased the speed of information exchange. This made it possible to carry out complex calculations in a very short time. In addition, information technologies have become one of the modern methods of communication, the main advantages of which are universal accessibility. The development of information technologies made it possible to obtain any necessary information in a short period of time. Modern information technologies have become the personification of the latest achievements of science and technology. The resulting hybrid marked a revolutionary leap in the history of information technologies. It was established that such information saturation not only changes the world, but also creates new problems that could not even be predicted. In particular, modern society is overflowing with various streams of information, as a result of which it will never be able to function normally.

Key words: *information, technology, information technologies, information systems, types of information technologies.*

Statement of the problem in a general form. In the history of mankind, innovations in the field of technology have repeatedly had a revolutionary impact on social, political and economic development. In recent years, thanks to the rapid development of information technologies, the world community has moved to the formation of a new information space, which is created on the basis of computerization and network communications. These objective phenomena of modern reality are accompanied by an increase in the amount of socially significant information used in the management systems of organized systems in order to rationalize their activities. Information accumulated in the process of human development becomes a source of saving time and public labor, that is, an essential factor in accelerating social development.

Today, the level of informatization of management processes is one of the most important indicators of social and economic progress achieved by states and individual societies and organizations. On the qualitative side, the increase in volumes of information used when solving management tasks leads to the rationalization of human labor and

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the growth of well-being. In addition, a modern person is surrounded by various information and information flows. Every year, the amount of information needed by a person increases. As a result, new methods and means necessary for its processing and preservation appear – more relevant and improved. Under the influence of these processes, a corresponding group is already beginning to form in society, for which the main professional occupation is working with information.

The economy and business structures also feel the significant impact of information, for which the possession of information is the key to successful development. Any economic structures need information about markets, their segmentation, requests for specific goods and services, promotion opportunities, etc. Consumers of such services also need information about the manufacturer, price, quality, etc. Improvement of the specified structures, under the conditions of the information economy, takes place on the basis of information technologies. Achieving the goals of organizations is based on the awareness of the management staff about new technologies under the conditions of a rapidly changing reality. In addition, information technologies provide a significant opportunity to anticipate the pace of socio-economic development of the modern state. We can say that information is the most important strategic resource for humanity today. As a result, the results of information technologies are a certain toolkit for the exercise of power in any field. A number of issues arise related to the use of information technologies at the current stage of development of society and the state. In order to get answers to them, it is worth familiarizing yourself with the available theoretical achievements regarding the specified questions.

Analysis and research of publications. The peculiarity of information technology is that the subject and product of work in it is information, and the tools of work are means of computing and communication. So, the concept of «information technology» is based on the fundamental concepts of «information» and «technology».

Technology (from the Greek «techne» – art, skill, skill and «logos» – knowledge, science) – a set of methods of processing, manufacturing, measuring the state, properties, and form of products that are carried out in the process of production. The task of technology as a

science is to identify regularities in order to determine and use in practice the most effective and economical production processes [2].

The term «technology» has many interpretations [1; 3; 17]. In a broad sense, technology is understood as the science of the laws of the production of material goods, investing in it three main parts: ideology, i.e. principles of production; tools, i.e. machines, machines, aggregates; personnel with professional skills [24]. For specific production, technology is understood in a narrow sense as a set of techniques and methods determining the sequence of actions for the implementation of the production process.

For any technology, a goal, object and means can be allocated. The goal of technology in production is to increase the quality of products, reduce the time of their production, and even reduce various types of costs. The production of information is aimed at the appropriate use of information resources and their supply of all elements of the organizational structure and is implemented by creating an information system. Information resources are the initial "raw material" for the management system of any organizational structure, and the final product is the adoption of certain management decisions [9]. Technology in general and information technology in particular is primarily a chain of procedures and operations performed sequentially (parallel) in time. It is not just a complex of scientific and technical knowledge. This is a collection of rules regulating technological processes (fig. 1).

As for information technologies, this concept arose relatively recently – in the XX century. For the first time, the term «information technology» was used in 1958 by the authors of an article by H. Levitt and T. Whistler, which was published in the Harvard Business Review. The authors emphasized that this concept does not yet have a single established name and called it «information technology». Information technology, in their opinion, consists of several interconnected parts. One of them includes techniques for rapid processing of large volumes of information, and its embodiment is a high-speed computer. The second part focuses on the application of statistical and mathematical methods to decision-making problems. It is represented by mathematical programming and operations research. The third part consists of modeling higher-order thinking using appropriate computer programs [22].

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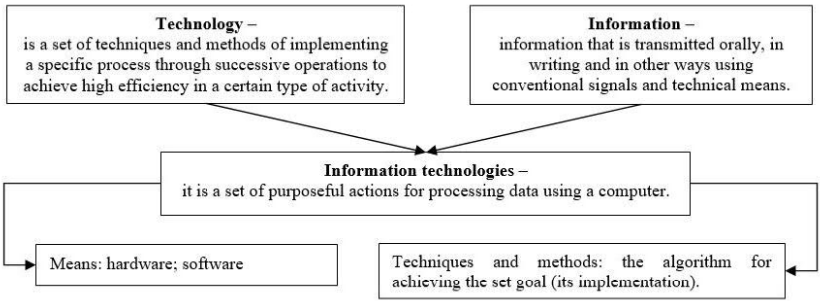

Fig. 1. Information technologies: concept and content.
Source: generated by the author

Information technologies are a set of methods, production processes and software and technical means, united in a technological chain, the implementation of which ensures the collection, storage, processing, output and distribution of information. This is done with the aim of reducing the labor-intensiveness of the processes of using the information resource, increasing their reliability and efficiency.

In view of the above, some researchers believe that information technology is a technology used to receive, store, transmit and/or analyze data [21]. According to some scientists, information and communication technology is a broader term for information technology, which refers to all communication technologies that enable users to access, search, store, transfer and manipulate information in digital form [23]. In addition, researcher N. Carr considers these terms identical, although he notes that the term «information technology» is widely used in the United States, while in other parts of the world the more accurate term «information and communication technology» is preferred [19]. In particular, N. Carr notes that «information technology» is a vague term, and uses it as a designation of technologies used for processing, storing and transporting information in digital form [19].

If we take into account the definition of information technologies in the Ukrainian dictionary of legislative and standardized terminology, then information technology is understood as a technological complex

consisting of software and technical means, methods and production processes. This technological complex should make it possible to collect, create, store, process, accumulate and transfer information [12]. So, information technology is a wide class of disciplines and fields of activity related to the technologies of data management and processing, including, with the use of computer technology.

According to the resolution adopted by UNESCO, information technology is a complex of interrelated scientific, technological, engineering sciences that study methods of effective organization of work of people engaged in processing and storing information using computer equipment and methods of organization and interaction with people and production equipment; peculiarities of their practical application, as well as related social, economic and cultural problems [25]. That is, according to this definition, information technologies unite a large interconnected group, a system of relationships in the sphere of social and cultural life of people, as well as the issue of solving emerging problems with the help of new knowledge. At the same time, H. Poppel defined information technology as the use of computing equipment and communication systems for the creation, collection, transmission, storage, and processing of information for all spheres of social life [20].

Currently, information technologies are most often understood as computer technologies. Specifically, information technology deals with the use of computers and software to store, transform, protect process, transmit, and retrieve information. Specialists in computer engineering and programming are often called IT specialists. Such definitions are too simplified and do not fully give an idea of information technologies, do not fully reflect their essential features [10].

In our opinion, it is worth agreeing with some researchers that modern information technologies, represented by computers, network technologies and modern communication technologies are the dominant field of development of modern science and technology [27]. Today's information technology is developing at a rate that no other technology has ever seen before, and has penetrated all aspects of society with a depth and breadth that no other technology has ever seen (Table 1). It is worth agreeing that the main events of the 20th century, especially after the

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Second World War, no matter how short they were, did not ignore the enormous progress of information technologies and their great economic and social impact [28].

Table 1.

Stages of information technology development

Stages	Content of technologies	Purpose of technologies
The 1st stage (up to the second half of the 19th century)	«manual» information technology, the tools of which consisted of: a pen, an inkwell, and a book. Communications were carried out manually by sending letters, packages, and dispatches through the post office.	presentation of information in the required form
The 2nd stage (from the end of the 19th century)	«mechanical» technology, equipped with more advanced means of mail delivery, the tools of which consisted of: a typewriter, a telephone, a voice recorder.	presentation of information in the required form by more convenient means.
The 3rd stage (40-60s of XX century)	«electrical» technology, the tools of which were: large computers and corresponding software, electric typewriters, photocopiers, portable recorders.	The main purpose of information technology begins to shift from the form of information presentation to the formation of its content.
The 4th stage (from the beginning of the 70s)	«electronic» technology, the main tools of which are large computers and automated control systems (ACS) created on their basis and information and search systems equipped with a wide range of basic and specialized software complexes.	technologies are shifting even more to the formation of the meaningful side of information for the management environment of various spheres of life, especially in the organization of analytical work.

continuation of the table 2

The 5th stage (from the mid-80s)	«computer» («new») technology, the main tool of which is a personal computer with a wide range of standard software and products for various purposes.	the process of personalization of ACS, which is manifested in the creation of support systems for decision-making by certain specialists
6th stage – modernity	«network technology» (sometimes it is considered part of computer technologies)	global and local computer networks are widely used in various industries

Source: generated by the author

Information technology is a process that uses a set of means and methods of data collection, processing and transmission to obtain new quality information about the state of an object, process or phenomenon. The goal of information technology is the production of information for human analysis and decision-making on the basis of any action.

The introduction of a personal computer into the information sphere and the use of telecommunication means of communication defined a new stage in the development of information technology. New information technology is information technology with a «friendly» user interface that uses personal computers and telecommunications equipment. The new information technology is based on such basic principles.

1) Interactive (dialog) mode of working with a computer.

2) Integration of actions with other software products.

3) Flexibility of the process of changing data and setting tasks [5].

Common types of software products are used as information technology tools: word processors, publishing systems, spreadsheets, database management systems, electronic calendars, functional information systems, etc. Information technology includes all the resources needed to manage information, including the computers, software, and networks needed to create, store, manage, transmit, and retrieve information.

Information technologies can be characterized by such basic properties as:

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1) the subject (object) of processing (process) is data;

2) the purpose of the process is to obtain information;

3) software, hardware, and software-hardware computing complexes are the means of process implementation;

4) data processing processes are divided into operations according to the given subject area;

5) the choice of controlling influences on the processes should be carried out by persons who make decisions;

6) criteria for optimizing the process are timeliness of information delivery to the user, its reliability, reliability and completeness [13].

Like any technology, information technology must meet the following requirements:

– ensuring a high degree of separation of the information processing process into stages, operations, actions;

– inclusion of all necessary elements to achieve the set goal;

– information technology should have a regular character [4].

In order to evaluate and use information technologies in society, it is necessary to classify them (fig. 2).

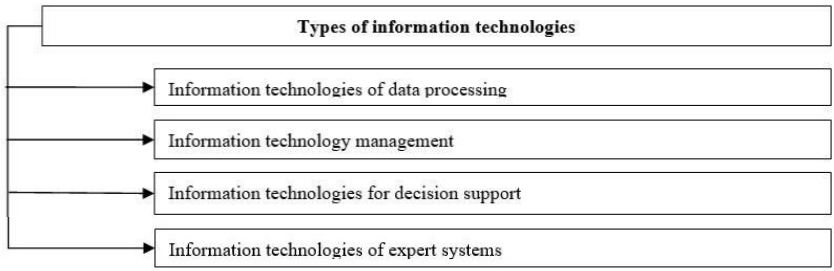

Fig. 2. Types of information technologies.

Source: generated by the author

The main types of information technologies include the following.

1) The information technology of data processing is intended for solving well-structured tasks, the algorithms for solving which are well known and for solving which all the necessary input data are available. This technology is used at the level of executive activity of low-skilled

personnel in order to automate some routine operations that are constantly repeated, managerial work.

2) Management information technology is intended for information service of all employees of enterprises related to the adoption of management decisions. Here, information is usually provided in the form of regular or special management reports and contains information about the past, present and possible future of the enterprise.

3)The information technology of the automated office is designed to complement the existing communication system of the company's personnel. Office automation involves the organization and support of communication processes both within the company and with the external environment based on computer networks and other modern means of transmitting and working with information.

4) Information technology for decision-making support is intended for the development of a management decision that occurs as a result of a process in which a decision-making support system (a computing unit and a control object) and a person (a control unit that sets input data and evaluates the result) participate.

5) The information technology of expert systems is based on the use of artificial intelligence. Expert systems enable managers to receive expert advice on any problem that these systems have accumulated knowledge about.

It should be noted that information technologies are used in many areas of human activity, including in the management system. But even in one field, information technology can have several types and variants of use. The following types of information technologies are distinguished in the management system:

- communication systems;
- document flow automation systems;
- accounting automation systems;
- decision-making systems;
- systems for automating banking operations;
- systems of automated workplaces [15].

In addition, regardless of the type of information technology, they all perform a number of functions. The main functions of modern information

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technologies include: collection, search, processing, and storage of data, which in a certain way influence management, production of new information and management optimization problems. An important stage is not only the automation of time-consuming routine and regularly repeated operations for processing a large amount of data. Equally important is the processing of data in order to obtain fundamentally new information that will contribute to the adoption of effective management decisions [6]. It is also worth agreeing with some researchers who believe that the main functions of information technology – storage, processing and transportation of data – have become available and affordable to everyone. Information technologies began to transform from potentially strategic resources into raw factors of production [11].

We emphasize that in most cases, different types of information technologies can be used simultaneously or in parallel, that is, they can be transmitted and processed by different information systems.

An information system is a system designed for receiving, storing, processing and issuing information, that is, a system whose main subject and product of functioning is information (fig. 3).

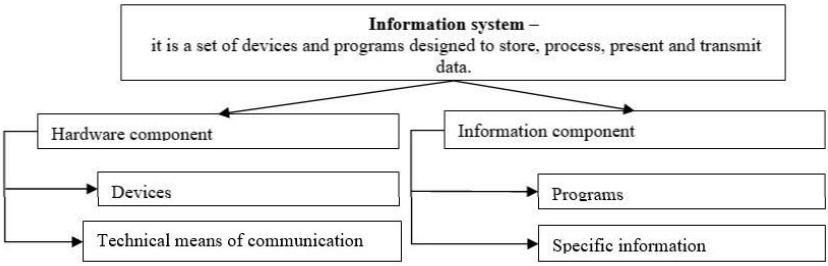

Fig. 3. Concepts and components of the information system.
Source: generated by the author

Information systems are more than just computers. Information systems create value for enterprises and provide organizational and management solutions for responding to environmental challenges. An information system is defined from a technical point of view as a system consisting of a number of interconnected components that collects

processes, stores and issues information to support organizational decision-making and management control [26].

An automated information system is a set of hardware and software for a specific purpose, functioning on the basis of computers, which have passed tests with fixed quality indicators and are provided with a set of documentation sufficient for qualified operation for the intended purpose and use as products of industrial and technical purpose.

In the context of the management process, the following main functions of information systems are distinguished:

– computational – timely and high-quality execution of information processing in all aspects of interest to the management system;

– communication – ensuring prompt transfer of information to specified points;

– information – provision of quick access, search and issuance of necessary information of all kinds;

– memorizing – continuous accumulation, systematization, storage and updating of all necessary information;

– observational – tracking and formation of all external and internal information necessary for management;

– regulatory – the implementation of informational and management influences on the object of control when the parameters of its functioning deviate from the specified (planned) values;

– optimization – provision of optimal planned calculations and recalculations as goals, criteria and conditions of operation of the facility change;

– self-improvement – accumulation and analysis of experience for the purpose of reasoned selection of the best management methods;

– diagnostic – diagnostics of the state of the control object;

– predictive – identifying the main trends, regularities and indicators of the development of the object and the environment [16].

An information system can include various subsystems, the composition and interaction of which allows for the implementation of its functions. The following types of subsystems are distinguished: functional, supply and organizational [18].

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Functional subsystems of the information system implement and support models, methods and algorithms for obtaining information.

Support subsystems include the following components:

– information support – is a set of implemented solutions in terms of volumes, placement and forms of organization of information circulating in the management system;

– technical support – a complex of technical means involved in the technological process of information transformation in the system;

– software – includes a set of programs of regular use, necessary for solving functional tasks, and programs that allow the most effective use of computing equipment;

– mathematical support – a set of mathematical methods, models and information processing algorithms used in the system;

– linguistic support is a set of language tools used in the system to improve the quality of its development and facilitate human-machine communication [18].

Organizational subsystems include:

– human resources – the composition of specialists participating in the creation and operation of the system, staff list and functional duties;

– ergonomic support – a set of methods and tools used in the development and functioning of IP, which create optimal conditions for the activities of personnel and the fastest possible mastery of the system;

– legal provision – a set of legal norms regulating the creation and functioning of information technologies, as well as the procedure for obtaining, transforming and using information;

– organizational support – a set of solutions that regulate the processes of creation and functioning of the system as a whole, and its personnel [18].

In most cases, all the types of information subsystems listed above are used simultaneously and sometimes integrated with each other. Data from one subsystem can be transferred and processed in another subsystem.

Considering the above, we can say that the main purpose of the information system is the implementation of information technology (organization of storage, processing, transmission of information, etc.). The

concepts of «information technology» and «information system» are closely related, but at the same time have significant differences. The functioning of the information system is impossible without knowledge of information technology oriented towards it. Information technology can exist outside the environment of the information system, but high efficiency of information technology is achieved only in information systems developed taking into account the specifics of the relevant technological operations. In addition, information technologies and systems are primarily management tools. Like any others, they serve to coordinate and control the progress of all processes during the achievement of established goals. The simple possession of these tools, like any other, does not guarantee success, but their absence can lead to losses and risks [7].

In addition, like any technology, information technologies have advantages and disadvantages [14]. The advantages of information technologies are clear to each of us. On the downside, information technology can lead to job losses in traditional industries such as manufacturing and services. They can lead to social problems such as unemployment and lower living standards. In addition, excessive use of information technology can lead to poor health, including problems with vision, posture and mental health.

It is worth emphasizing that information technologies are and will be both a boon and a threat to the modern world. In order to minimize the negative impact, it is necessary to implement technologies taking into account environmental and social aspects, as well as to educate people about the responsible use of information technologies. Only then will information technologies become a boon for the modern world, and not a threat.

Conclusion. Modern society has moved to a new life stage, where information plays the main role. As a result, the modern development of society is directly interconnected with the need to collect process and transmit large volumes of information and transform it into a product of significant value. This was the reason for the global transition from an industrial to an information society. And the emergence and spread of the Internet led to a large-scale growth of communication in various spheres of human activity.

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Therefore, information today is one of the most valuable resources of society along with traditional material types of resources. And we can also perceive information processing processes as a certain technology. Considering such features, there is still no unified understanding of the concept of «information technologies». In our opinion, they should be perceived as a set of means and methods of organizing the interaction of people, society, organizations, and states, as well as the social, political, economic, and cultural problems associated with all of this.

We have emphasized that modern information technologies require the ability to competently work with information and information systems. In addition, the implementation of the specified works requires orientation in the types of information technologies. A detailed understanding of the functions performed by one or another type of information technology will not be superfluous. The above will only help in working with information technology, which does not require complex preparation, large costs and complex equipment.

It has been established that information technologies occupy an important place in the life of a modern person. Until recently, the use of such technologies was rare. Today, they have practically turned into an everyday thing. However, information technologies continue to create new opportunities for life, in many ways facilitating the work and life of a modern person. That is why modern society is practically unimaginable without information technologies.

It became logical to transform information technologies into a vital stimulus for the development of not only the global community, but also other spheres of life. Today, there are practically no areas in which information technologies are not used. In particular, the active development of information technologies and their implementation increased the speed of information exchange. This made it possible to carry out complex calculations in a very short time. In addition, information technologies have become one of the modern methods of communication, the main advantages of which are universal accessibility. The development of information technologies made it possible to obtain any necessary information in a short period of time. Modern information technologies have become

the personification of the latest achievements of science and technology. The resulting hybrid marked a revolutionary leap in the history of information technologies. Today, production and transport, banks and exchanges, mass media and publishing houses, defense systems, social and law enforcement databases, service and health care, educational processes, offices for processing scientific and business information, finally, the Internet – information technologies are everywhere. Such information saturation not only changes the world, but also creates new problems that could not even be predicted. In particular, modern society is overflowing with various streams of information, as a result of which it will never be able to function normally.

Thus, information technology has turned into one of the most profitable and rapidly growing fields. Modern information is an important production and commercial resource. Today, it is practically impossible to find a field in which information technologies are not used. Therefore, we can claim that information technologies have deeply penetrated our lives and modern society, and are changing them in a fundamental way. Humanity will never be the same as it was before the advent of information technology. And it is also practically impossible to predict the possible ways of further development of information technologies. Only one thing is clear – humanity is waiting for something grandiose. And if the pace of development of information technologies does not change, it will happen soon enough.

ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ: ПОНЯТТЯ, ВИДИ ТА ФУНКЦІЇ

В статті проаналізовано поняття «інформації» та «інформаційних технологій», оскільки на сьогодні питання розвитку та вдосконалення інформаційних технологій є особливо актуальними. Такий стан речей потребує ґрунтовного розуміння основних понять. В статті вказано, що інформаційні технології представляють собою сукупність методів та способів отримання, обробки та надання інформації в інтересах різних користувачів та споживачів. В сучасних умовах функціонування суспільства та держави інфор-

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маційні технології є ефективним інструментом вдосконалення процесів управління у різних сферах.

Наголошено, що інформаційні технології сучасного рівня передбачають обов'язкове вміння грамотно працювати з інформацією та інформаційними системами. Крім того, здійснення вказаних робіт передбачає необхідність орієнтуватися у видах інформаційних технологій.

Узагальнено основні види інформаційних технологій: інформаційні технології обробки даних; інформаційні технології управління; інформаційні технології автоматизованого офісу; інформаційні технології підтримки прийняття рішень; інформаційні технології експертних систем.

Висвітлено функції інформації та інформаційних технологій, які виконує той або інший вид інформаційних технологій. Вказане лише допоможе в роботі з інформаційними технологіями, яка вже й так не вимагає складної підготовки, великих затрат та складної техніки.

Встановлено, що інформаційні технології займають вагоме місце в житті сучасної людини. На сьогодні практично відсутні сфери, в яких не використовуються інформаційні технології. Доведено, що активний розвиток інформаційних технологій та їх впровадження, збільшили швидкість обміну інформацією. Вказане дозволило проводити складні розрахунки за дуже короткий час. Крім того, інформаційні технології стали одним із сучасних способів спілкування, головними перевагами якого є загальнодоступність. Розвиток інформаційних технологій дозволив отримувати будь-яку необхідну інформацію за короткий проміжок часу. Сучасні інформаційні технології стали уособленням останніх досягнень науки та техніки. Утворений гібрид ознаменував революційний стрибок в історії інформаційних технологій. Констатовано, що така інформаційна насиченість не лише змінює світ, але й створює нові проблеми, які не можливо було навіть передбачити. Зокрема, сучасне суспільство переповнене різноманітними потоками інформації, внаслідок чого воно вже ніколи не зможе нормально функціонувати.

***Ключові слова**: інформація, технологія, інформаційні технології, інформаційні системи, види інформаційних технологій.*

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