

# Modernization of Education in the Context of Informatization and Automation

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## Summary

The article studies the implementation of automation in the education process as a convenient interface of a document management system, on the one hand, which makes it easy to navigate the program, requiring from the user only a small amount of any special skills in working with electronic computers, on the other hand, it provides to the user operational information about all the data of interest to him, taking into account the access rights given to this or that information, stored in the enterprise database.

### Key words:

*automated system, organizational management, control system, education.*

## 1. Introduction

The problem of automation of production processes and management processes as a means of increasing labor productivity has always been and remains relevant in any area of human activity, the field of education is also no exception. The need to automate management processes in the field of education is explained by the tasks of facilitating the work of personnel, therefore, increasing the efficiency of work on the preparation of various reports and statements and their processing, as well as the processing and storage of various data.

At the present stage of automation, the most promising is the automation of planning and management functions based on personal computers installed directly at the workplaces of specialists. These systems are widely used in organizational management called automated workstations (AWPs). This will allow the use of the

system by people who do not have special knowledge in the field of programming, and at the same time will allow to supplement the system as needed.

In the context of modernization of education, the process of informatization is becoming more and more relevant. The use of information technology by the administration of educational institutions can increase the efficiency of management. The system allows you to work with various templates of documents spending the least amount of time searching and organizing the necessary information.

Object: Automated control systems in the educational process.

Subject: Automated system of office work in an educational institution.

Purpose: Implementation of an automated system in the educational process.

## 2. Theoretical Consideration

An automated control system (ACS) is a set of hardware and software tools designed to control various processes within a technological process, production, or enterprise. ACS are used in various industries, energy, transport, etc. The term "automated", in contrast to the term "automatic", emphasizes the retention of certain functions for the human operator, either of the most general, goal-oriented nature, or not amenable to automation. ACS with a Decision Support System (DSS) are the main tool for increasing the validity of management decisions.

The most important task of the ACS is to increase the efficiency of object management based on the growth of labor productivity and improve the methods of planning

the management process. Distinguish between automated control systems for objects (technological processes - automated process control systems, enterprises - automated control systems, industry - automated control systems) and functional automated systems, for example, the design of planned calculations, material and technical supply, etc.

Goals of control automation

In general, a management system can be viewed as a set of interrelated management processes and objects. The generalized goal of control automation is to increase the efficiency of using the potential capabilities of the control object. Thus, a number of goals can be distinguished:

1. (Providing the decision maker with) relevant data for decision making.
2. Acceleration of the execution of certain operations for the collection and processing of data.
3. Reducing the number of decisions.
4. Increasing the level of control and performance discipline.
5. Improving management efficiency.
6. Reducing the costs of decision makers to perform auxiliary processes.
7. Increasing the degree of validity of the decisions made.

#### **ACS composition:**

The ACS includes the following types of support: information, software, technical, organizational, metrological, legal and linguistic.

Main classification signs

The main classification features that determine the type of ACS are:

- the sphere of operation of the object of management (industry, construction, transport, agriculture, non-industrial sphere, etc.)
- type of controlled process (technological, organizational, economic, etc.);
- the level in the system of public administration, including the management of the national economy in accordance with the current management schemes for sectors (for industry: industry (ministry), all-Union association, all-Union industrial association, research and production association, enterprise (organization), production, workshop, site, technological unit).

#### **ACS functions:**

The functions of the ACS are set in the terms of reference for the creation of a specific ACS based on the analysis of management goals, the assigned resources to achieve them, the expected effect of automation and in accordance with the standards applicable to this type of ACS. Each ACS function is implemented by a set of task complexes, individual tasks

and operations. ACS functions generally include the following elements (actions):

- planning and (or) forecasting;
- accounting, control, analysis;
- coordination and / or regulation.

The required composition of elements is selected depending on the type of a specific ACS. ACS functions can be combined into subsystems according to functional and other characteristics.

#### **Classes of ACS structures:**

In the field of industrial production from the standpoint of management, the following main classes of structures of control systems can be distinguished: decentralized, centralized, centralized dispersed and hierarchical [1].

#### **Decentralized structure:**

Building a system with such a structure is effective in automating technologically independent control objects for material, energy, information and other resources. Such a system is a collection of several independent systems with its own information and algorithmic base [2].

To develop a control action on each control object, information about the state of only this object is required.

#### **Centralized structure:**

The centralized structure implements all object management processes in a single management body, which collects and processes information about controlled objects and, based on their analysis, generates control signals in accordance with the system's criteria. The emergence of this class of structures is associated with an increase in the number of monitored, regulated and controlled parameters and, as a rule, with the territorial dispersion of the control object [1-4].

#### **Centralized dispersed structure:**

The main feature of this structure is the preservation of the principle of centralized management, i.e. development of control actions on each control object based on information about the states of the entire set of control objects. Some functional devices of the control system are common to all channels of the system and, using switches, are connected to individual devices of the channel, forming a closed control loop.

The disadvantages of the system are as follows: complication of information processes in the control system due to the need for data exchange between processing and control centers, as well as correction of stored information; redundancy of technical means intended for information processing; the

complexity of synchronizing information exchange processes [5-7].

### **Hierarchical structure:**

With an increase in the number of control problems in complex systems, the amount of processed information increases significantly and the complexity of control algorithms increases. As a result, it is impossible to carry out centralized control, since there is a discrepancy between the complexity of the controlled object and the ability of any governing body to receive and process information.

In addition, in such systems, the following groups of tasks can be distinguished, each of which is characterized by the corresponding requirements for the response time to events occurring in the controlled process:

data collection tasks from the control object and direct digital control (reaction time, seconds, fractions of a second);

extreme control tasks related to the calculation of the desired parameters of the controlled process and the required values of the regulator settings, with the logical tasks of starting and stopping the units, etc. (reaction time - seconds, minutes);

optimization and adaptive process control problems, technical and economic problems (reaction time - a few seconds);

informational tasks for administrative management, dispatching and coordination tasks on the scale of a shop, an enterprise, planning tasks, etc. (reaction time - hours).

### **Types of ACS:**

Automated process control system or ACS - solves the tasks of operational management and control of technical objects in industry, energy, transport

Automated production management system (ACS) - solves the problems of organizing production, including the main production processes, incoming and outgoing logistics. Carries out short-term planning of production, taking into account production capacity, analysis of product quality, modeling of the production process. To solve these problems, MIS and MES systems are used, as well as LIMS systems.

Problems and tasks in the implementation of ACS.

The introduction of a management automation system, like any major transformation in an enterprise, is a complex and often painful process. Nevertheless, some of the problems that arise during the implementation of the system are well studied, formalized and have effective solution methodologies. Studying these problems in advance and preparing for them greatly facilitates the implementation process and increases the effectiveness of the further use of the system.

The following are the main problems and tasks that arise in most cases when implementing control systems and recommendations for their solution:

Lack of setting a management task at the enterprise;  
the need for partial or complete reorganization of the enterprise structure;  
the need to change business technology in various aspects;  
resistance of employees of the enterprise;  
temporary increase in the workload on employees during the implementation of the system;  
the need to form a qualified team for the implementation and maintenance of the system, the selection of a strong team leader.

Unfortunately, a national approach to management has not yet been fully developed. At the moment, Russian management is an explosive mixture of Western management theory (which in many respects is not adequate to the existing situation). The need to change the technology of working with information and business principles.

An efficiently built information system cannot but make changes to the existing technology for planning budgeting and control, as well as managing business processes.

Firstly, one of the most important features of a corporate information system for a manager is management accounting and financial control modules. Now each functional unit can be defined as a financial accounting center with the corresponding level of financial responsibility of its head. This, in turn, increases the responsibility of each of these managers and provides top managers with effective tools for precise control over the execution of individual plans and budgets.

The implementation of the automation system introduces significant changes in the management of business processes. Each document that displays in the information field the course or completion of a particular end-to-end business process is automatically created in the integrated system based on the primary document that opened the process. The employees responsible for this business process only control and, if necessary, make changes to the positions of the documents built by the system. For example, a customer has placed an order for a product that must be fulfilled by a certain date of the month. The order is entered into the system, based on it, the system automatically creates an invoice (based on the existing pricing algorithms), the invoice is sent to the customer, and the order is sent to the production module, where the ordered type of product is exploded into separate components. Based on the list of components in the purchasing module, the system creates purchase orders for them, and the production module accordingly optimizes the production program so that the order is fulfilled on time. Naturally, in real life, various options are possible for unrecoverable disruptions in the supply of components, equipment breakdowns, etc., therefore, each stage of the order must be strictly controlled by the circle of employees

responsible for it, who, if necessary, must create a managerial impact on the system in order to avoid undesirable consequences. or reduce them.

Formation of a qualified group for the implementation and maintenance of the system, a team leader. The implementation of most large automation control systems is carried out using the following technology: a small (3-6 people) working group is formed at the enterprise, which undergoes the most complete training in working with the system, then this group is responsible for a significant part of the work on the implementation of the system and its further support. The use of such technology is caused by two factors: firstly, the fact that the enterprise is usually interested in having specialists at hand who can quickly solve most of the work issues when setting up and operating the system, and secondly, training its employees and their use is always significantly cheaper than outsourcing. Thus, the formation of a strong working group is the key to successful implementation of the implementation project. A particularly important issue is the choice of the leader of such a group and the system administrator. The manager, in addition to knowledge of basic computer technology, must have deep knowledge in the field of business and management.

#### **Automated system in education**

The current stage of social development, characterized by the deepening of economic ties and the growth of interdependence of states, objectively determines the continuous growth of the role of information in the social and technical process, in the solution of global problems that humanity faces, having entered the third millennium. Achievements of scientific and technological progress in many fields, including communications informatics, have provided an opportunity for the practical implementation of the idea of forming an information society.

In the further development of society, a special role belongs to promising information technologies, which ensure an increase in production efficiency and labor savings, the rapid dissemination of information and scientific knowledge. Today they are the core and catalyst of scientific and technological progress, with their help the problems of creating and introducing new technologies based on the activation and effective use of the main strategic resource of mankind - information are solved.

One of the areas of use of information communication technologies in the activities of public authorities, organizations and enterprises is "the development of an electronic document management system, office work and document management standards." The relevance of improving the traditional office work is determined by the need for the effectiveness of management activities, accelerating the movement of documents in the organization, reducing the complexity of processing documents. The created promising information technology automated system

(hereinafter AS) of office work should increase the effectiveness of management through the formation of a single documented information space, which gives users the means of effective collaboration with documents anywhere and at any time. The main difficulty in the creation, implementation and operation of AS office work (in accordance with the state standard, the synonym is management documentation) is generated by the inconsistency of requirements for information support on the part of users related to management. Users are related to any subjects who turn to the means of information support for the factual, documentary, analytical and other information they need and use it in making management decisions [8-10].

AS office work, satisfying the information needs of users, must ensure the achievement of the following goals:

- increasing the efficiency and streamlining the work of public authorities, organizations or enterprises;
- integration of the processes of documentary support for the management of the institution within the framework of a single corporate information system;
- increasing productivity, labor efficiency of management and employees of public authorities, organizations or enterprises;
- integration of information processes within the framework of cooperation between government bodies, organizations and enterprises.

The main form of submission of information to management is a document. The main function of the management document is to ensure the centralized activities of the organization. With the help of documenting information, it acquires the necessary properties and, in the form of documents, performs its main role in management processes, leading management influences from the subject to the control object signaling a reverse reaction [11].

The main feature of the industry, the creation of automated systems is the concentration of complexity at the initial stages of the analysis of requirements and the design of specifications with a relatively low complexity and laboriousness of the subsequent stages. In fact, here comes an understanding of what the future system will do, how it will work in order to meet the requirements for it. The vagueness and incompleteness of system requirements, unresolved issues and mistakes made at the stages of analysis and design give rise to difficult, often unsolvable problems at subsequent stages and, ultimately, lead to the failure of the entire work as a whole. Organization-wide should have a unified system of field and attribute names and terminology for describing system data. The subtlety here is that most of these classifiers

associate each term with a non-repeating code corresponding only to the given term.

### Tasks and ways of implementing the AS

In the context of the dynamic implementation of reforms in Ukraine, quite often there are changes in the areas of activity of state bodies, organizations and enterprises (hereinafter referred to as organizations), which, as a rule, leads to the reorganization of their structure. The introduction of information technology gives the greatest effect when modernizing the internal structure of organizations. The main implementation strategy is the maximum development of communications and the development of new organizational relationships, previously economically inexpedient. The productivity of the organizational structure increases, since data archives are rationally distributed, the volume of information circulating through the system channels is removed, and a balance of the effectiveness of each management level and the volume of tasks to be solved is achieved. The system is expanded strictly in accordance with the needs and capabilities of the organization, and the gap between the information and organizational structure is bridged. In these conditions, the role of the effectiveness and quality of management decisions is increasing, therefore, the automated office work system is one of the most important components of preparation and decision-making. Office work is a branch of activity that provides documentation and organization of work with official documents. Documentation support of management defines a system of principles and rules that establish uniform requirements for documentation, organization of work with documents and their archival storage in the process of management, taking into account the information technologies used. Documentation of management activities - a regulated process of creating a document (development of content, design, agreement, approval, publication) on paper or other media, ensures its legal force. Organization of work with documents, creation of optimal workflow, provision of storage, search for use and control of execution of documents in the current activities of the institution [5].

Document flow - the movement of documents in an organization from the moment they were created or received until the completion of execution and sending. It should be noted that office work is a set of measures to ensure a preschool educational institution, and workflow is the movement of documents within the framework of documentation support for management.

- documentation (preparation, execution, agreement, approval and release of documents);

The AS is designed to improve the efficiency of management activities of organizations by automating the entire range of

work with documents and must solve the following main tasks:

- ensuring document flow (reception, registration, organization of the passage of documents and their projects, sending, transferring documents and for archival storage);

- ensuring work with documents in the process of management (execution control, accounting, operational storage, organization of classification systems, indexing, search and processing of documents; protection against unauthorized access; sharing documents while observing the required level of access control; ensuring the decision-making and reporting process by documents; information service for users);

- Automation of procedures for archiving, archival storage and destruction of documents whose life cycle has been completed (compliance with the rules for storage, search and use; transferring to state storage or destruction of archival documents).

The automated system creates a single information space that provides users with tools for collaborating with all documents of the organization: incoming and outgoing correspondence, internal organizational and administrative materials, as well as accompanying correspondence - throughout their entire life cycle. After the end of the "active life" of documents, the system must maintain their archival storage or record information about their destruction or transfer to state storage.

Implementation of the AS of management documentation in organizations can be done as follows:

- order or perform in-house development of a system that is directly focused on the subject area of the organization;

- to purchase a ready-made circulation-ordering system from the number of programs offered on the Russian market, and adjust it to the subject area of the organization.

The problem of protecting information by modifying it, making it impossible for an unauthorized person to read it, has worried mankind since ancient times. The history of cryptography is the same age as the history of the human language. Moreover, since in ancient societies only a select few owned it. So, for example, shorthand was born. With the widespread use of writing, cryptography began to form as an independent science. The first cryptosystems are already found in the writings of Nostradamus and Leonardo da Vinci.

The rapid development of the cryptographic system was received during the years of world upheavals: revolutions, the First and Second World Wars. From the post-war period to the

present day, the advent of computing has accelerated the development and improvement of cryptographic techniques.

The expansion of the spheres of application of modern information technologies puts forward new requirements for the principles of construction and properties of information systems. Today, the problem of security is becoming increasingly important. This will be explained primarily by the introduction and modernization of information technologies in organizations and enterprises that have realized the need to ensure the confidentiality of their data, as well as the emergence of new technical techniques, such as a legally binding electronic digital signature. In addition, paradoxically, the improvement of computer technology has led to the creation of many loopholes for leakage at the cost of information. So, the development of local, and then corporate and global computer networks, through which large volumes of government, military are transmitted. Of a commercial and private nature, which does not allow unauthorized persons to access it, significantly increases the possibility of intruders entering the information system of an enterprise, if appropriate measures are not taken [8-11].

At the same time, new powerful computers, network and neural computing technologies made it possible to discredit cryptographic systems that were not yet considered undisclosed.

Cryptology (kryptos - "secret", logos - "science") deals with the problem of protecting information by transforming it. Cryptology is divided into two areas - cryptography and cryptanalysis. The goals of these directions are directly opposite and resemble the struggle of the developers of small arms and body armor.

## Conclusions

When choosing an electronic document management system, many factors should be taken into account, and it is preferable to make the final decision based on a comprehensive analysis of the possibilities, depending on the requirements and specifics of the customer.

When using the created document management system, the user gets the opportunity to work with various categories of documents, perform actions for receiving and registering, monitoring their implementation, which greatly facilitates and speeds up this time-consuming process, and the user himself can make some changes to the database.

The convenient interface of the document management system, on the one hand, makes it easy to navigate the program, requiring from the user only a small amount of any special skills in working with electronic computers, on the other hand, it provides the user with operational information about all the data of interest, taking into account access rights given to this or that information, stored in the enterprise database.

## References

- [1] Gofen A., Blomqvist P. Parental entrepreneurship in public education: a social force or a policy problem? *Journal of education policy*, 2014, № 29 (4), pp. 546–569. 61.
- [2] Grant W. *Pressure Groups, Politics and Democracy in Britain*. Homel Hempstead, Harvester Wheatsheaf, 2011, 230 p.
- [3] Meera N. S. Quality education for all? A case study of a New Delhi government school, *Policy futures in education*, 2015, № 13 (3), pp. 360–374.
- [4] Sosenski S. Financial Education for Children: School Savings Programs in Mexico (1925–1945), *Historia Mexicana*, 2014, № 64 (2), pp. 645 – 662.
- [5] A. Syrotenko, O. Sotnikov M. Iasechko, V. Larin, S.Iasechko O. Ochkurenko, and A. Volkov. Model of Combined Solid Plasma Material for the Protection of Radio-Electronic Means of Optical and Radio Radiation, *IJATCSE*, 8(4), 2019, pp. 1241 — 1247. [doi:10.30534/ijatcse/2019/33842019](https://doi.org/10.30534/ijatcse/2019/33842019).
- [6] O. Turinskyi, M. Burdin, M. Iasechko, V. Larin, Y. Gnusov, D. Ikaev, V. Borysenko, and V. Manoylo. Protection of board radioelectronic equipment from the destructive powerful electromagnetic radiation with the use of natural technologies, *IJETER*, 7(11), 2019, pp. 542 — 548. [doi: 10.30534/ijeter/2019/237112019](https://doi.org/10.30534/ijeter/2019/237112019).
- [7] M.Iasechko, Y. Gnusov, I. Manzhai, O. Uhrovetskyi, V.Manoylo, A. Iesipov,O. Zaitsev, M. Volk, and O. Vovk. Determination of requirements for the protection of radio-electronic equipment from the terroristic influence by electromagnetic radiation, *IJETER*, 7(12), 2019, pp. 772 - 777. [doi: 10.30534/ijeter/2019/077122019](https://doi.org/10.30534/ijeter/2019/077122019).
- [8] McMillan R. Man Builds Twitter Bot That Humans Actually Like. *Wired*. URL: [wired.com/2012/06/twitter\\_arm/](http://wired.com/2012/06/twitter_arm/)
- [9] Ktepi B. Deception in political social media // ed. K. Harvey. *Encyclopedia of social media and politic*. Vol. 4. Thousand Oaks, CA: SAGE Publications. P. 357-359.
- [10] Kotler P., Lee N. *Corporate social responsibility: Doing the most good for your company and your cause*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2005.
- [11] Rampton S., Stauber J. *Trust us! We're experts: How industry manipulates science and gambles with your future*. Tarcher. 2002.