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COMPUTER INFORMATION TECHNOLOGY AS OBJECT OF CREATION AND IMPLEMENTATION

The main scientific and methodological statements concerning system approach to the computer information technology research as object of creation and use are studied. This is a generalization of the experience of the authors in the field of information technology in science, education and medicine creation and implementation [1].

Key words: systems research, system approach, computer information technology.

System analysis: history of the issue. As we know the development of computer technology to a large extent contributed to the formation of information technology (IT) as some commercial products. Informware of first computers was included in so-called mathematical software, consisting of programming languages that described the "structure" and "algorithms" of data processing. Formation data into database structures from mathematical software allowed extract software as independent part which includes the description of data structures, languages of programming and communication. Today computers exited from the scope of create and came into the scope of use.

The widespread introduction of computers in various fields of national economy and defense industries contributed to the emergence of a new category of specialists - computer users who are focused on the analysis of information processes and the use of computers as tools for the implementation of information technology (along with material and energy technologies). First of all it was a theory of management that is formed on the basis of the new cybernetics science, and all other technologies according to the stages of the life cycle of equipment and technology generations (including information technology).

The whole end of XX century 60's and early 70's there was a period using the computers for the creation of Automated Control Systems (ACS), Computer Aided Design (CAD), Automated Systems Research (ASR), in education, medicine and so on. In the Institute of Cybernetics of Ukraine a scientific branch ITIS - Information Technologies and Systems under the leadership of Deputy Director of V.I.Gritsenko, that largely contributed to the formation in Cherkasy Engineering and Technological Institute faculty with a similar name – FITIS was created.

When Ukraine became a sovereign country, "the wind blew from the West" and market relations have become priority in life, then the role of computer technologies of wide application intensified more. And as soon as the "initial capital" appeared the intensification of the implementation of IT in various spheres of human activity is observed.

Scientific and methodological foundations of IT development and implementation. The system approach to the creation of scientific and methodological foundations of IT is based on the widespread use of the "system" and "system analysis" concepts as the methodology of research and creation of complex systems, derived from the basics of the General Theory of Systems and the Formal Theory of Problem Solving. The complex information system is considered as a gradual evolutionary complication: from the network of connected elements through their systematic ordering and allocation of the investigated part of the information environment to the so-called technological definition in the form of technological sequence:

$$\sum = \{< \text{Structuring (elements + connections)}, < \text{Functioning (signals + functions of elements)}>, < \text{Goal-orientation (goals + methods of making optimal decisions)}>\}.$$

At the stage of the system analysis, the "structure" introduces the concept of "structure" as a network of connections between elements, which can traditionally be represented by a matrix of

connections, and the so-called structural approach to the description of complex systems is formed. In this case, both the elements and the connections between them are described independently, including the connections between elements and the system inputs and outputs. If it is not always possible to describe the structure of the system analytically it is important to describe it in "language environments" of modern computer networks (in particular, "cloud technologies").

In [2], on the example of the well-known matrix equation of a linear static system

$$AX = BY,$$

where X is the output from the system as a set of connected elements, Y is the system output, the matrices A (a_{ij}, s_{ij}) and B (b_{ij}, s_{ij}) are the matrices of elements of connections (which do not necessarily have to be "single"), that include a description of all types of matrices of the links S, a system analysis and possible schemes for its use. Such a description provides an opportunity to study the structure of the system as well as to find its optimal structure in the tasks of structural optimization with use these matrices as parameters. For example, Classes of information systems in automation with a variable (or controlled) structure are known. It is clear that these processes occur in the so-called supersystem where the controllable part of the system is a subsystem.

At the "functioning" stage, system analysis is used for further detail and refinement the structure of the system, which is found to be locally optimal in the previous stage, as well as for search of the algorithms of functioning (management) at the implementation of technological sequences of functioning in accordance with the specified requirements (constructive, technological and other restrictions due to the peculiarities of realization of material, energy and information processes). In traditional optimization problems, this is defined as a model of processes and constraints on the physical implementation of the system. For example, when creating some transport unit its logistic use is considered at this stage. This may be the transportation of goods and passengers, as well as military use, etc. If the structure plays a key role in the first stage of system analysis then the process of functioning plays a key role at this stage. In this case there is need to introduce the concept of "state" as a set of values of variables that characterize these processes. And traditionally, in this case, the matrix equation is used:

$$X'=AX + BY,$$

where X is variables of a dynamical system, and matrices A and B take into account not only the structure of the system, but also reflect its functioning. The input variables are not only external influences on the system from the environment but also internal influences to ensure its "homeostasis".

Achievement of goals. The task of systematic research is to subordinate a certain structured system (both in structure and processes) to some other system (supersystem). For example, in the linear case, the mandatory requirement for subordination is in the form of a predicate function: $\chi = [X = Y]$, where $\chi = \{0, 1\}$, X and Y are some variables, X is the output from the system itself, and Y is the exit from some external system (including system of requirements). For example, using the model of a static system, you can find the parameters (and structure) of the system and using the model of the dynamic system you can find control actions to ensure the homeostasis of the system.

Conclusion. All of the foregoing fits into the logical form of the system approach:

<Goal - goal tree> - <Problems - logical structure> - <Methods - algorithms> -
<Means - program-methodical and program-technical>,

which is expedient to use in the study of computer information technology as objects of creation and implementation.

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