UDC 303.732.4
DOI: 10.20535/SRIT.2308-8893.2021.1.10

MODELS FOR DEVELOPMENT OF THE INFORMATION-CONTROL COMPLEX OF THE ENTERPRISE

V.N. VOLKOVA, A.E. LEONOVA, A.V. LOGINOVA

Abstract. This article provides a brief analysis of the development of concepts and terms used in the automation the processes of production and enterprise management. The conclusion is made about the preference of the term "information-control complex" (ICC) of the enterprise and the expediency of using various concepts in its creation. A model for the development of ICC is proposed, based on the definition of a system that implements the system-target approach, and the "engineering" concept.

Keywords: control system, enterprise architecture, engineering, information-control/management complex.

INTRODUCTION

During the development of automation of information support for enterprise management, and new technologies emerged, the terminology, types of information systems, and standards governing their development and functioning changed. In the initial period of control automation, the following terms were used: data processing systems (DDS); databases (DB); automated control systems and automated information systems (ACS and AIS), information-retrieval system (IRS), etc.

In connection with the political and economic transformations of 1990–1991, mainly, enterprises began to acquire foreign local or domestic information systems (IS) developed for certain types of activities of organizations (accounting, personnel, etc.), create separate pages of information on the Internet. But then it is realized that in order to manage an organization, it is necessary to combine automated information systems developed for individual functions and types of activity into a single enterprise management automation system. The concept of enterprise architecture emerged. With the intensification of the development and implementation of innovations, interest in the initial understanding of the term engineering is revived.

The variety of the notions complicates the organization of work on the automation of enterprise management. Therefore, it is advisable to conduct a comparative analysis of the usefulness of these terms for specific organizations, taking into account their emergence and modern interpretation, and to develop methodological foundations and models for the further development of automation of production processes and organizational management of the enterprise.

OVERVIEW OF APPROACHES TO CREATION OF AUTOMATION SYSTEMS FOR ENTERPRISE CONTROL

In the 1960, when automation began to be used to manage enterprises in the Soviet Union, the methodology for developing automated control systems was ini-

tially based on the fundamental principles of the control developed in the theory of automatic control. In particular, the principle control on based deviations or principle feedback

$$y(t)_{\text{exit}} = F(u(t).z(t)),$$

where $y(t)_{\text{exit}} \in R_k$; R_k — vector of output signals; $z(t) \in R_p$; R_p — disturbance vector; $F = R_m \times R_p \to R_k$ — transformation that determines the type of relationship between y_{exit}, u and z; k — number of output actions; m — number of control actions; p — number of disturbing impact $z(t)$; $u(t) \in R_m$ — control action calculated by the formula:

$$u(t) = G[\,|\,F(x(t), O_p) - y_{\text{req}}\,|\,],$$

where $x(t) \in R_m$ — predetermined control (the law of the system functioning); $z(t) \in R_p$; R_p — disturbance vector; y_{req} — desired result (setpoint); $G: R_k \to R_m$, $G(O_k) = O_m$ — feedback block conversion; $O_k \in O_p$, $O_m \in O_p$; m — number of control actions; p — number of disturbing impact $z(t)$.

In the mid-1960s, the American Society for Production and Inventory Management (APICS) formulated a number of principles according for proposed to build models of the main production processes that were applied to solve the problems of managing the inventory of an enterprise and were called the concept of MRP (Material Requirements Planning). Later, as this approach was applied to other production processes, the concepts of MRPII, ERP, etc. appeared. On this basis, software products were created, which became quite widespread.

This approach, hereinafter called the process approach, is aimed at solving practical problems associated with the activities of enterprises, and can be successfully applied to relatively small firms. However, for scientific and production associations, large enterprises of mass production, such an approach, which was originally called functional and technological, is very difficult to implement.

Therefore, during the period began to create automated information systems (AIS) as the first stage of automated control systems in the Soviet Union, a system-targeted approach was adopted. A classification of automated systems was developed, focused on different levels of enterprise management, including their structural divisions, industries and the state as a whole. The developed branch ACS (OACS), regional or territorial ACS (RASU, TASU) and enterprise ACS were supposed to be combined into the National Automated System (OGAS) for collecting, storing and searching information.

To manage the development of automated systems, the corresponding guiding methodological materials were prepared, in which the concepts of the functional part (FP), formed on the basis of the analysis of the goals and functions of the enterprise, and the supporting part (SP), including information, technical, program and other types of ACS support. The structure of the FP was initially developed in the form of a tree-like hierarchy, then, as the number of subsystems increased, in the form of matrix, multi-level and structures.

In the 1990s, when the information market of software products began to actively develop, subject-oriented and corporate information systems (SOIS, CIS) were developing on the basis of new information technologies. The most developed

automated information systems that support the internal activities of mass production enterprises include:

$$IIS = < ERP\ MRPII,\ MRP,\ MES,\ PDM >,$$

where *MES* — manufacturing execution system; *MRP* and *MRPII* — Material Requirements Planning; *ERP* — Enterprise Resources Planning; *PDM* — Product Data Managerment.

In 1987, the concept of "enterprise architecture" emerged, which was first presented in an article by J.A. Zachman [1] in the form of a two-dimensional matrix, in columns — "the main aspects of the activity ("what", "how", "where", "who", "when", "why"); and line by line — different descriptions of the system from the point of view of business leaders, managers and developers. In 1996–1997 E.Z. Zinder proposed a "3D model" of the enterprise [2, 3]. The model introduces a axis of time, where the intervals for the implementation of various projects and stages of development of the IS and the entire enterprise are located, and the principles of the Zachman matrix are used as other axes. This model became the basis for multidimensional structures. Then it was created multidimensional mofels, used in the systems of the Department of Defense and other US Federal government agencies [4–9]: TAFIM (Technical Architecture Framework for Information Management). FEAF (Federal Enterprise Architecture Framework). TOGAF (The Open Group Architectural Framework), DoDAF (Department of Defense Architecture Framework), etc. Standards ISO 14258: 1998 (as amended from 2000) and ISO 15704: 2000 have been developed.

In the 1990s to combine heterogeneous software products into a single automated information system of an enterprise, the idea of an information infrastructure was proposed [11], on the basis of a modification of which, in the next section, the concept of an information management complex is substantiated and models for its implementation are proposed.

THE CONCEPT OF A MULTI-LEVEL INFORMATION-CONTROL COMPLEX

The concept and model (Fig. 1) of a multilevel information management complex (IAC) is based on the use of a system definition that implements the system-target approach [12]

$$S_{\text{def}} \equiv <Z, STR, TECH, COND, N>, \qquad (1)$$

where Z — goals that can be interpreted as the structure of the functional part of the ACS, as the needs of users;

STR — he structure of the relationship between Z and information arrays, i.e. databases; searcher arrays of documents, repositories information of various kinds;

TECH — technologies in a broad sense, including technical means (i.e. devices or devices that are necessary for collecting, registering, storing, processing and presenting information), methods of collecting, storing, processing information, including algorithms, software procedures or packages of application programs, information technologies, etc.;

COND — conditions, i.e. external and internal factors influencing the creation and functioning of ICC; for their analysis, it is useful to use the attribute

"space of target initiation", i.e. to identify the factors of the supersystem and the actual environment (φ_{ext}), sub-departmental and the system itself (φ_{int});

N — people interacting with the system, i.e. those who order, design, use this ICC. For a general name for everyone involved in the development and use of systems, W.R. Ashby, at the beginning of the development of cybernetics and systems theory, introduced the term "observer"; and nowadays, the term "stakeholders" is often used [13].

The definition (1) and illustrating its stratified representation (Fig. 1) help to theoretically substantiate the structure of the information-control complex, to manage its development. The definition can be interpreted taking into account the purpose and conditions of its development. It is necessary to determine the relationship between the components of the user, functional and information strat-levels, to justify the choice of the necessary technologies.

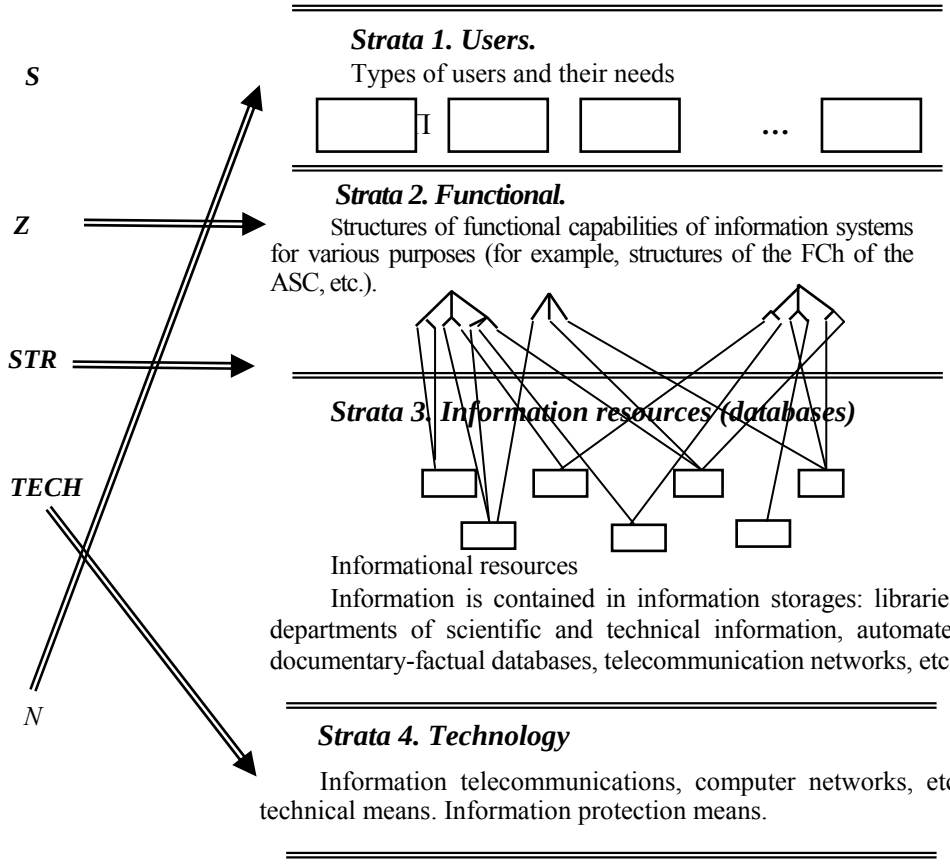

Fig. 1. Model of a multi-level information-control complex

The stratified representation helps to solve the problems of managing projects and programs for the development of ICC, allocation of financial, material and human resources based on the development and application of appropriate methods and automated procedures to determine the composition of the components of each strata, assess the impact of a project in the field of ICC on its development.

In particular, for the analysis and formation of a functional strat, it is advisable to use the methods of structuring goals and functions, methods of analyzing

information needs, developed in the theory of information retrieval. The assessment of the significance of the elements of each of the strata can be carried out using the methods of organizing complicated examinations: the method of paired comparisons in the modification of T. Saati [13], the method of deciding matrices by G.S. Pospelov [14], the informational approach of A.A. Denisov [15] and others [16, 17], take into account different criteria — technical, economic, social.

For example, you can apply the model of deciding matrices:

"*Functional strata* $< \alpha_j >$" $\Rightarrow$ "Information resourcces $< \beta_i >$" $\Rightarrow$ "Technology $< \gamma_1 >$".

Then the algorithm for analyzing the model:

Evaluation $\alpha_j \rightarrow$ Checkness $\sum_j \alpha_j = 1 \rightarrow$ Evaluation α_{ij} for each $\alpha_j \rightarrow$

$\rightarrow$ Checkness $\sum_i a_{ij} = 1$ for each $\alpha_j \rightarrow$ Calculation $\beta_i = \sum_j a_{ij}\alpha_j \rightarrow \sum_i \beta_i = 1 \rightarrow$

$\rightarrow$ Evaluation $b_{ki} \rightarrow$ Checkness $\sum_k b_{ki} = 1$ for each $b_i \rightarrow$ Calculation

$\gamma_k = \sum_i b_{ki}\beta_i \rightarrow \sum_k \gamma_k = 1$.

The considered concept and models make it possible to manage the development of IAI. At the same time, both the concept of enterprise architecture and the concept of a multi-level ICC help to reflect the structure of the ICC, make decisions about its development, but do not take into account the processes of the enterprise, including its interaction with the environment, receipt, execution and implementation of orders. Therefore, it is proposed to additionally use concept of the engineering in the development of ICC.

ROLE THE CONCEPT OF ENGINEERING FOR THE DEVELOPMENT OF THE INFORMATION- CONTROL COMPLEX

For the development of ICC, it is important to use the concept of "engineering" in the original meaning of this term in the 16th century (from Lat. Ingenium — ingenuity, invention, knowledge). In the XVII century engineering began to form into a separate profession. Scale drawings help to maintain the integrity of the product presentation and to see the role and place of parts in the product. Development leads to the combination of engineering with scientific progress, with technological innovation.

Engineering in the original understanding is a superstructure over design and development activities, allowing the results of engineering activities to be brought closer to their direct implementation, to obtain a new, synergistic, result, the emergence. Engineering includes all stages of the life cycle of product creation, order fulfillment — from concept to implementation and maintenance, including delivery, installation supervision, condition acceptance and field supervision, if necessary.

Engineering activities (although in the Soviet Union the foreign term "engineering" was not used) was provided by the service of the chief engineer, which coordinated not only the departments of the chief designer, chief technologist,

chief mechanic, etc. activities, but also subdivisions such as a bureau of inventions and discoveries, helping in the organization of rationalization and inventive activities, and subsequently – special design bureaus, or even research institutes, which supplemented the support of the full life cycle of engineering activities — from inventions to innovative products (new types of products or their blocks), innovative technologies that ensure the development of enterprises.

When accompanying the creation of complex products, the path from concept to implementation and support is not a unidirectional, but a complex graph, including the order or purchase of components through tenders, the distribution of work, taking into account the specialization and cooperation of not only divisions, but even enterprises. Each stage of the complete life cycle is a complex process. In particular, design and technological activities are supported by a multilevel system of drawings of various types (general block diagrams, schematic diagrams, product projections, etc.) and normative and technical documentation. To implement these works, knowledge of technical disciplines (mechanics, reliability theory, systems engineering), management disciplines (project management, quality management, etc.), economic and legal disciplines is required. This served as the basis for the implementation of engineering in the form of consulting activities in individual areas required to complete the stages and sub-stages of the project. This practice arose in the 18th century, when engineering became a professional activity and a separate discipline.

Professional associations and schools of engineering have emerged. Standards have been created [18, 19], in which engineering is interpreted as technical consulting services related to the development and preparation of the production process and the provision of the production process and the sale of products. This form of engineering is widely used in modern practice. There are specialized engineering centers, mainly engaged in automated support of the stages of the life cycle of development and implementation of innovations, professional communities and associations that unite engineers from different countries. There are different points of view both on the content of engineering activities and on the concept of "engineering". The content of the concept of "engineering" is constantly expanding, including areas that are more and more distant from the classical engineering activity. Therefore, it is proposed to investigate the essence of this concept using the theory of an open system with active elements.

On the basis of his research, the Belgian biologist L. von Bertalanffy discovered that in open systems, as opposed to closed (isolated from the environment), thermodynamic laws appear that contradict the second law of thermodynamics. In accordance with the concept of L. von Bertalanffy "... it is quite possible to introduce negentropy", that is, to decrease the entropy; and "... such systems can maintain their high level and even develop in the direction of increasing the order of complexity" [20].

L. von Bertalanffy explained negentropic tendencies mainly by the openness of the system. Further studies of development processes made it possible to understand that development occurs not only due to the openness of the system, but also due to the active elements that initiate innovation. The studies of the Russia scientist E. Bauer allowed a deeper understanding of the development processes. E. Bauer investigated one of the fundamentally important for understanding the development of living systems regularities of the fundamental disequilibrium of living systems, that is, the desire to maintain a stable imbalance and use energy to

maintain oneself in a disequilibrium state. E. Bauer explains this by the fact that all structures of living cells at the molecular level are pre-charged with "excess" excess energy in comparison with a non-living molecule, and the body receives external energy not for work, but to maintain itself in a nonequilibrium state [21]. On the basis of understanding the ideas of E. Bauer (eg, [22]), it can be concluded that, in fact, we are talking about the biopotential of a "living cell", which is determined not only by physiological energy as a source of negentropy. At a certain level of development of a living thing, such a source of negentropic processes can be interpreted as a potential based on information and knowledge. Then we can conclude that, taking into account the research of E. Bauer, for the development of any organization (enterprise, territorial association, etc.), it should have a kind of "living cell" that accumulates energy/information in order to to create innovations that drive the development of the organization.

Such an interpretation of the source of negentropic processes can be associated with the concept of "engineering" in the original sense of this term (from the Latin Ingenium — ingenuity, knowledge), that is, in accordance with the definition given in the Oxford Dictionary, in which engineering is interpreted as the activity of applying scientific knowledge for the design, construction, control production of machines and plants, etc. Based on this, it can be concluded that for the development of an organization, engineering tasks should be solved by teams of qualified professionals specializing in the relevant types of professional activity.

To manage this activity, the coordination of the relevant sub-divisions or organizations performing this work is necessary. Such coordination requires the creation of a system of information support at all stages of the life cycle of the activity, for which the concept of engineering is applied, that is, it is necessary to create a unified information-control complex, including software for engineering and design activities, accompanying regulatory methodological, regulatory-technical, organizational and administrative documentation. Therefore, it is not enough for organizations to use the advisory services of specialized organizations, but it is necessary to develop and apply the form of engineering in the original sense of the notion.

This form represents design-technological and regulatory-technical support for the entire life cycle — from the invention of an innovation or receipt of an order, the development of the structure of its research, design, technological, production implementation and delivery to the customer. To provide such support, it is necessary to create an automated information-control complex of an enterprise that implements the engineering concept. This information complex provides the necessary coordination of all stages of the life cycle of the innovation process, for which the idea of engineering is used.

Taking this into account, when creating an ICC, it is necessary to have subdivisions that, in accordance with E. Bauer's concept, accumulate energy/information in order to invent innovations that ensure the development of the organization. To aid in decision-making, it should be possible to include in such an ICC models that help in making decisions on the analysis and selection of innovations (eg [23–31]). It is also necessary to create an environment that would ensure interconnection in the information space and access to information of persons using it at the appropriate stages of the life cycle. The basis of such an environment can be an intelligent knowledge representation system of the type proposed in [32]. The development of such a system and the coordination of engineering work at the enterprise should be part of the functions of the unit dealing with the organization of the strategic development of the enterprise (organization).

CONCLUSION

Analysis of the concepts and notions used in the creation of automated information support for production processes and enterprise management allows us to draw some conclusions.

The notion ASC, which determined the ultimate desired goals of automating the management of enterprises and organizations, outstripped the capabilities of technologies that existed to create such systems at that time. Experience in the creation and application of software products for individual arms of activity (also called automated systems — accounting, personnel, etc.), solve the problem of ensuring the business processes of small and medium-sized companies. However, for large enterprises and organizations, other forms of integrated information support are needed.

The concept of enterprise architecture has made it possible to create multidimensional information bases. However, despite the fact that, in accordance with the concept of the Gartner Group, architecture is considered not only as a static model of a complex system, but also as a process, a set of guidelines and rules that determine the construction of new subsystems, this concept still does not focus on information support processes of creation and implementation of innovations, that is, to display the dynamics of the functioning of the system. Perhaps that is why recently there has been a revival of interest in the concept of engineering, including among the author of the architectural concept of a 3D-enterprise [33].

The use of the definition of a systembased on the system-target approach made it possible to substantiate the concept of a multi-level information and control complex, linking goals, sources of information and technical means to ensure enterprise management. The use of the concept of an open system by L. von Bert-lanffy and the study of the features of this system in the works of E. Bauer made it possible to substantiate the role of engineering as an innovative technology for the development system of information support for control and managing the development of enterprises, territorial and other organizations.

Therefore, the idea of creating an ICC, implementing the concept of engineering, automating the collection of information at all stages of the life cycle of production and organizational management of enterprise, and the creation on this based the unified information-control environment, the basis of which can be an intelligent knowledge representation system of the type proposed, for example, in [32], seems perspective. The implementation of the ICC allows you to combine different concepts and manage the development of information support for the enterprise.

REFERENCES

1. J.A. Zachman, “The structure of information systems architecture”, *IBM Systems Journal,* vol. 26, no. 3, 1987.
2. E.Z. Zinder, “New system design: information technology and system design”, *DBMS*, no. 4, 1, 1995.
3. E.Z. Zinder, “3D-enterprise — a model of a transforming system”, *Director of Information Service*, no. 4.
4. A. Danilin and A. Slyusarenko, *Architecture and Strategy. “Yin” and “Yang” of information technologies*. M.: Internet University of Information Technologies, 2005. Available: INTUIT.ru//razym.ru›komp/59613-danilin-a-slyusarenko-a

5. R. Sessions, *Comparison of the four leading architecture building methodologies*, 2007. Available: http://msdn.microsoft.com/ru-ru/library/ee914379.aspx
6. S. Kotusev, "TOGAF: Just the Next Fad That Turned into a New Religion", *TOGAF Is Not an EA Framework: The Inconvenient Pragmatic Truth*, K.L. Smith (ed.), Great Notley, UK: Pragmatic EA Ltd., 2018, pp. 27–40.
7. Cole Perks and Tony Beveridge, *Enterprise IT Architecture Guide*. New York, NY: Springer, 2003.
8. Scott R. Bittler and Greg Kreutzman, *Gartner Enterprise Architecture Process: Development*, 2005.
9. N. Dedic, "FEAMI: A Methodology to include and to integrate Enterprise Architecture Processes into Existing Organizational Processes", *IEEE Engineering Management Review*. doi: 10.1109/EMR.2020.3031968.
10. W.J. Clinton and A. Gore, "Technology for America`s Economic Growth, a New Direction to Build", *Executive Office of the President*. Washington, DC, 1993, 39 pp.
11. V.N. Volkova, "Razvitiye opredeleniya sistemy [System definition development]", *Mater. Mezhdunarodnoy nauchno-prakticheskoy konferentsii «Sistemnyy analiz proyektirovaniya i upravleniya»: sb*. SPb.: Izd-vo SPbGPU, 2001, pp. 12–14.
12. R.L. Ackoff, *Re-Creating the Corporation: A Design of Organization for the 21st Century*. New York, Oxford: Oxford University Press, 1999.
13. Thomas L. Saaty and Kevin P. Kearns, *Analytical Planning: The Organization of Systems*, 1985.
14. G.S. Pospelov and V.A. Irikov, *Programmno-tselevoye planirovaniye i upravleniye* [Target planning and management]. M.: Sov. radio, 1976, 440 p.
15. A.A. Denisov, *Sovremennyye problemy sistemnogo analiza* [Modern problems of systems analysis]. SPb.: Izd-vo Politekhn. un-ta, 2008, 304 p.
16. V.N. Volkova and V.N. Kozlov (eds.), *Modelirovaniye sistem i protsessov* [Modeling systems and processes]. M.: Yurayt Publ., 2015, 449 p.
17. N.D. Pankratova, *Sistemniy analíz. Teoríya ta zastosuvannya* [System analysis. Theory and application]. Kiív: Naukova dumka, 2018, 347 p.
18. *GOST R 57306-2016. Engineering. Terminology and basic concepts in the field of engineering*. Available: docs.cntd.ru›document/437092138.
19. *ISO/IEC 15288: (IEEE Std 15288—2008).* Systems and Software Engineering — System Life Cycle Processes. International Organization for Standardization.
20. L. von Bertalanfy, "System Theory — a Critical Review", *General System*, vol. 7, pp. 1–20, 1962.
21. E. Bauer, *Teoreticheskaya biologiya* [Theoretical biology]. M.L.: VIEM Padl., 1935, 206 p.
22. A.L. Shamis, *Modeli povedeniya, vospriyatiya i myshleniya* [Models of behavior, perception and thinking]. M.: Intuit, 2010, 230 p.
23. V.N. Volkova, V.I. Karpov, A.E. Leonova, A.V. Loginova, and E.V.L. Romanova, "Concept of engineering as a basis for development cyber-physical system", *CEUR Workshop Proceedings*, 2019.
24. V.N. Volkova, Yu.A. Golub, and A.V. Loginova, "Multilevel Model for Management the Regional System of Training in Conditions of Introducing Digital Technologies", *Proceedings of 2018 17th Russian Scientific and Practical Conference on Planning and Teaching Engineering Staff for the Industrial and Economic Complex of the Region, PTES 2018*, pp, 181–184, 8604276.
25. V.N. Volkova, A.S. Kudryavtseva, A.V. Loginova, Y.Y. Chernyy, and A.E. Leonova, "System Analysis of Innovative Technologies of the Industrial Revolutions", *Proceedings of the 3rd International Conference Ergo-2018: Human Factors in Complex Technical Systems and Environments, Ergo 2018*, pp. 57–61.
26. V. Volkova, A. Leonova, A. Loginova, and Y.Chernyy, "System analysis of the development of information-communication technologies", *CSIS'2019: XI International Scientific Conference Communicative Strategies of the Information Society, ACM International Conference Proceeding Series, ACM, New York, 2019*, pp. 1–6. Available: https://doi.org/10.1145/3373722.3373765

27. V.N. Volkova, A.E. Leonova, E.V. Romanova, and Y.Y. Chernyy, "Engineering as a Coordinating Method for the Development of the Organization and Society", *Lecture Notes in Networks and Systems*, 184, pp. 12–21, 2021.
28. V. Volkova, G. Gorelova, and N. Pankratova, "The Development of the Cyberphysical System Concept on Base of the Interdisciplinary Theories", *IEEE 2nd International Conference on System Analysis and Intelligent Computing, SAIC 2020,* 9239213.
29. V.N. Volkova, B.S. Fleishman, F.P. Tarasenko, and A.V. Loginova, "Further Development of Potential Feasibility Theory for Complicated Systems According to the Unified General-System Principle", *Lecture Notes in Networks and Systems*, 184, pp. 446–453, 2021.
30. N. Pankratova, P. Bidyuk, and I. Golinko, "Decision support system for microclimate control at large industrial enterprises", *CEUR Workshop Proceedings*, pp. 489–498, 2020.
31. N. Pankratova, P. Bidyuk, and I. Golinko, "Synthesis of a multidimensional control system for a precision complex of artificial microclimate", *System Research & Information Technologies*, no. 1, pp. 7–20, 2020. doi: https://doi.org/10.20535/SRIT.2308—8893.2020.1.01
32. Ye.S. Kuzin, *Predstavleniye znaniy i resheniye informatsionno-slozhnykh zadach v komp'yuternykh sistemakh* [Representation of knowledge and solution of information-complex problems in computer systems]. M.: Novyye tekhnologi, 2004, 32 p.
33. E.Z. Zinder, "Values-directed enterprise engineering", *Business Informatics*, no. 3 (45), pp. 7–19, 2018.

Received: 17.03.2020

INFORMATION ON THE ARTICLE

Violetta N. Volkova, ORCID: 0000-0001-9658-5135, Peter the Great St. Petersburg Polytechnic University, Russia, e-mail: violetta_volkova@list.ru

Alla E. Leonova, ORCID: 0000-0002-2124-0295, Scientific Research Center for Electronic Computing JSC "NITSEVT", Russia, e-mail: alla.leonova@nicevt.ru

Alexandra V. Loginova, ORCID: 0000-0002-7783-7795, Peter the Great St. Petersburg Polytechnic University, Russia, e-mail: alexandra-lo@yandex.ru

МОДЕЛІ ДЛЯ РОЗВИТКУ ІНФОРМАЦІЙНО-КЕРУВАЛЬНОГО КОПЛЕКСУ ПІДПРИЄМСТВА / В.М. Волкова, А.Є. Леонова, О.В. Логінова

Анотація. Подано стислий аналіз розвитку понять і термінів, що використовуються в автоматизації процесів виробництва та управління підприємством. Зроблено висновок про перевагу терміна «інформаційно-керувальний комплекс» (ІКК) підприємства та доцільність використання різних концепцій під час його створення. Запропоновано модель розвитку ІКК, засновану на визначенні системи, що реалізує системно-цільовий підхід та концепцію «інжиніринг».

Ключові слова: система управління, архітектура підприємств, інжиніринг, інформаційно-керувальний комплекс.

МОДЕЛИ ДЛЯ РАЗВИТИЯ ИНФОРМАЦИОННО-УПРАВЛЯЮЩЕГО КОМПЛЕКСА ПРЕДПРИЯТИЯ / В.Н. Волкова, А.Е. Леонова, А.В. Логинова

Аннотация. Приведен краткий анализ развития понятий и терминов, используемых в автоматизации процессов производства и управления предприятием. Сделан вывод о предпочтительности термина «информационно-управляющий комплекс» (ИУК) предприятия и целесообразности использования при его создании различных концепций. Предложена модель разработки УИС, основанная на определении системы, реализующей системно-целевой подход, и концепции «инжиниринг».

Ключевые слова: система управления, архитектура предприятия, инжиниринг, информационно-управляющий комплекс.