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SYSTEM PARADIGM AS A BASIS FOR SOLVING INFORMATION MANAGEMENT TASKS IN AN INDUSTRIAL ENTERPRISE

BARTOV OLEG (ORCID 0000-0002-1471-2426)¹,
TRETYAKOVA ELENA (ORCID 0000-0002-9345-1040)²

¹JSC “SVEL Group”,

²Perm State University

Abstract. In the article the enterprise information system of an industrial enterprise is considered from positions of system economic theory.

The difference between the automation process and digitalization process using information systems is shown.

Enterprise information system components are defined in the object, environment, project and process systems.

Consequences of imbalance of the information management subsystems are described.

Keywords: information system, system economic theory, digitalization, automation.

The transition from production processes automation to their digitalization creates opportunities for transformation of obsolete enterprise management practices as well as the application of new approaches and the formation of new entities. With automation only a partial representation of the economic processes of production in the information system occurs, a significant part of the enterprise activity in this case has no digital footprint. Digitalization, in its turn, allows to reflect production activities as close as possible, creating the potential for the application of system economic theory to the “digital twin” of an enterprise as an economic system.

If we assume that all digitized entities are information, then it turns out that the enterprise sets management tasks that are inextricably linked with information and defined as information management tasks. There are three components of information management: enterprise management with the help of information, information management as a separate entity and management of the process of digitalization.

The basis of the digital economy is the models of economic, technical, natural and social systems presented in digital form. Since the economic system of the enterprise is reflected in digital form through the use of an information system consisting of information

subsystems, the need for a systems approach to information management is determined. G.B. Kleiner, who is author of the theory of space-time systems, synthesized the system economic theory which is ideally suitable for the management of digitized information about the economic activity of the enterprise. To implement the systems approach to information management, it is necessary to solve two tasks: the first task is the structuring of enterprise systems in the form of allocation of information subsystems as management objects, the second task is a system grouping, which can be solved using the space-time theory of systems as a base [3, 4].

The first task of the systems approach is solved through the structuring of information subsystems of the enterprise. Each information subsystem reflects the management of the enterprise in its field of activity, at the same time in such systems is the management of the information itself, and the links between these subsystems allow us to consider their integration into the overall system, that is especially important in the digitalization of the next aspect of activity. As solving the second task, it is proposed to classify each information subsystem, that is used in the manufacturing enterprise, as an object, environment, project or process system.

It is proposed to include the information systems of production management of ERP class (Enterprise resource planning) and the information systems of warehouse management – WMS (Warehouse management system) to the object subsystem. This is due to the fact that the production that defines the enterprise is limited by the space from which the finished product is produced, on the one hand, and is not limited by the time on the other, because production activity exists throughout the life of the enterprise.

It is proposed to include the information systems of customer orders and demands management – CRM (Customer relationship management), information systems of supply management – SCM (Supply Chain Management) as well as information systems of staffing – HRM (Human Resources Management) to the environment subsystem. This is due to the fact that customers, suppliers and potential employees are not limited by the space, on the one hand, and are not limited by the time on the other, because their activity isn't less than the life of the enterprise.

It is proposed to include the information systems of development of new products and their production technology – PDM (Product data management) to the project

subsystem. This is due to the fact that any project of new product development is limited by the time, on the one hand, and limited by the enterprise space on the other.

It is proposed to include the information systems of budgets planning and execution, asset valuation, management of mutual settlement with contractors and other systems that are united by the concept of FM (Finance management) as well as systems of work with information of a legal nature to the process subsystem. This is due to the fact that financial mechanisms are almost always focused on a limited period of time – month, quarter, year, and laws have time to change several times during the life of the enterprise on the one hand, are not limited by the space of the enterprise on the other, because they store the data and guidelines of the enterprise outside its physical space.

Previously, a model of a corporate information system of a manufacturing enterprise, that shows rational connections between its segregate information systems, was developed [5]. As a solution to both tasks of implementing a systems approach to information management the model of corporate information system grouped according to the system paradigm is presented in fig.1.

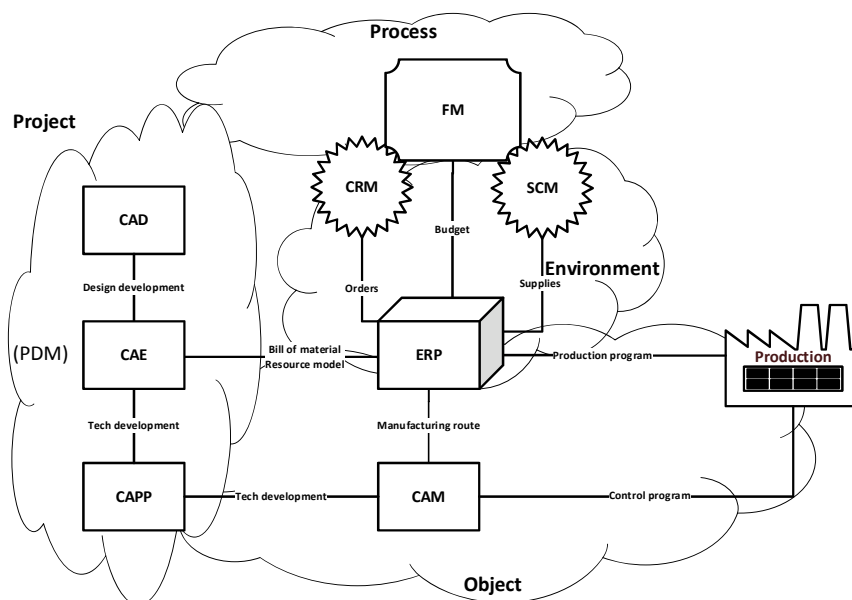


Fig. 1 The systems approach to corporate information system of an industrial enterprise

The project system implements design and technological developments on the basis of the time resource provided by the object system in the form of allocation of time boundaries during the initiation of development projects. The activity of time use by the project system is manifested in the form of design and technological documentation that is used in production. The activity of the object system is provided by orders which are received because of the space resource of the environment system in the form of the customer orders, purchase orders and the labor market. As a result of the order completion, the object system produces a specific product that transfers into the environment system. This transfer shows the intensity of space use. The time resource of the process system is determined by the financial period within which the financial management of the enterprise is conducted. Mutual settlements with the elements of the environmental system, that are carried out during the financial period, determine the activity of using the time resource of the process system. The process system, in its turn, provides the tools, methods and design technologies, that are formed outside the space of the enterprise, to the project system, that is limited by space, through the project financing. The intensity of the space use by the project system is manifested in the form of creation of intangible assets, the importance of which to maintain a stable state of the economic system of the enterprise is growing in the conditions of digitalization of the economy.

Thus, taking as a basis the representation of the related subsystems [4, 6], the corporate information system can be represented in the form of a tetrad, that is shown in fig. 2.

The problem of performance of the information system in the digital economy can be an imbalance within the tetrad of the information system. The imbalance is defined in the unequal relationship of the components of the tetrad [7]. The main reason for the imbalance is the lack of information subsystem of any type, or the lack of an orderly process of management of the relevant activities. Part of the imbalance may be caused by a mismatch between the elements of the information system and the activities of the enterprise. The mismatch will not allow to digitize the activities in the information system with sufficiently fullness.

Thus, it can be concluded that the work with information using the system paradigm is an actual approach to help industrial enterprises to move from the automation of management processes to the digitalization of such processes, and, consequently, to adapt to the conditions of the digital economy. In order to facilitate and increase the efficiency of the process of digital adaptation, special attention should be paid to the balance of information subsystems, balance indicators should be determined and at the same time implementation and operation should be managed at the strategic level.

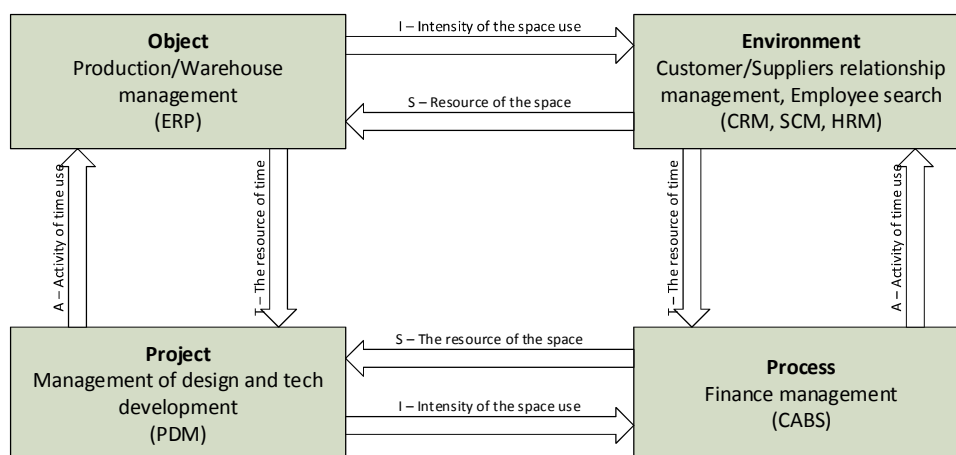


Fig. 2 The tetrad of the enterprise information system

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