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METHODOLOGICAL PRINCIPLES OF BUSINESS PROCESS MODELING AS A COMPONENT OF THEIR REENGINEERING IN THE ACTIVITIES OF INDUSTRIAL ENTERPRISES

Tetiana I. Lepeyko
Dr. (Economics), Professor,
Simon Kuznets Kharkiv National University of Economics
ORCID: https://orcid.org/0000-0001-8667-509X
E-mail: lepeyko.tetyana@gmail.com

The article examines the methodological principles of business process modeling as a component of reengineering in economic activity, as well as the directions of the theory of self-organization of complex systems. The features of the modern economic system are noted, which determine certain features of business process management, including their reengineering. The problems in implementing business process modeling during their subsequent reengineering are proven. The principles of methodological construction of business process modeling systems during their reengineering are determined. The stages of business modeling of processes that are being redesigned are considered. The reengineering of the financial activities of industrial enterprises in modern economic conditions is studied using simulation modeling. The use of Baumol and Miller-Orr models when modeling business processes during their reengineering is substantiated. The corresponding conclusions are formed on scientific research within the framework of the topic of this article.

Keywords: *business process modeling, business process reengineering, business process simulation modeling, enterprise, synergy.*

JEL Classification: *M11, C63, L23, O32*

Abbreviations:
RBP – business process reengineering
IBP – business process modeling
IMBP – business process simulation

Statement of the problem. Since the industrial revolution, the process of globalization has continued to play the role of a global reorganizer. Companies from various industries are adapting to their role in the market at an increasing pace. They are building complex business ecosystems in accordance with the ever-growing number of highly specialized business partners and progressive consumers who take the place of ordinary consumers at the heart of business processes that create added value for the enterprise [1]. Today, the enterprise is a complex social system that must be seen as a complex organism with many dimensions and components – consumers, production and suppliers, connected into a single whole to create a business network. Changes in the enterprise are accompanied by laws similar to the laws of management of any structure: the negation of negations and the transformation of quantitative changes into qualitative ones according to the principle of thesis – antithesis – synthesis. Therefore, enterprise architecture is a practical guide to radical enterprise transformation, providing a dynamic description of deep but smooth structural changes in an enterprise that is trying to be efficient and competitive [2].

Analysis of recent research and publications. Among the scientific publications that included research on the methodological principles of business process modeling during their reengineering, it is necessary to note the work of Wolf V., Revkin S. [2], which explores the methodological principles of enterprise transformation. The issue of synergy in business process modeling during radical transformations of economic systems and the methodology of transformational changes is explored in his work [3] by Lebed O. E. Economist Kurdyumov S. P. in his scientific development [4] studies the methodological basis for forming the future state of an enterprise through the implementation of business modeling of processes during their radical redesign, using the theory of self-organization of economic systems. The theoretical foundations of modeling business processes for the purpose of their effective self-organization and management of social systems in conditions of transformational shifts in the economy are highlighted in the work [5] by Romanova V. L. Reengineering of financial activities of enterprises in modern conditions of the Ukrainian economy using simulation modeling is revealed in the work [6] by scientist Donets O. S.

Highlighting previously unresolved parts of the general problem to which this article is devoted. Among the analyzed scientific articles that were devoted to modeling

business processes in the system of their reengineering, not much attention was paid to the methodology of this process. Therefore, the author of the article focused on the methodological principles of modeling business processes as a component of their reengineering in the activities of industrial enterprises.

Purpose and objectives of the study. The purpose of the study is the methodological principles of modeling business processes as a component of their reengineering in the economic activities of industrial enterprises.

Main tasks:

– to investigate the methodological principles of business process modeling as a component of their reengineering in the economic activities of industrial enterprises;

– to prove the problems in implementing business process modeling as a component of their reengineering;

– to explore the directions of the theory of self-organization of complex systems;

– to determine the principles of methodological construction of business process modeling systems during their reengineering;

– consider the phasing of business modeling of processes being redesigned;

– to investigate the reengineering of the financial activities of industrial enterprises in modern business conditions using simulation modeling;

– draw the necessary conclusions from this study.

Presentation of the main material. When studying the methodological principles of business process modeling as a component of their reengineering in the economic activities of business entities, it should be noted that with the emergence of ideas about a new architecture that takes into account the dissipative nature of economic systems, existing approaches to building an architectural model of business processes, as well as business process management systems, will quickly demonstrate their inability to be flexible and effectively manage in complex business ecosystems. De Hok, the founder of VISA International, claims that his organization is based on the principles of mixing chaos and order. Today, VISA International unites more than 20 thousand financial institutions, 14 million merchants and 600 million consumers in 220 countries. De Hok explains that by chaos he understands any nonlinear, adaptive, complex organization or system that is self-organizing, self-managing and whose behavior harmoniously mixes the characteristics of chaos and order [7].

It should be noted that the modern economic system, which is any industrial enterprise, has a number of features that determine the features of managing business processes, including their RBP, taking place within its boundaries [8].

First, the enterprise is characterized by instability. In the presence of instability, the role of external factors is constantly changing. Under certain conditions, a minor impact on the enterprise can lead to significant and unpredictable consequences.

Secondly, the enterprise is characterized by coordination effects, which manifest themselves when its components correlate, coordinate their behavior. As a result of coordinated interaction, processes of ordering occur, the emergence of certain structures from chaos. The greater the deviation from the state of equilibrium, the stronger the coverage of interconnections, the higher the coordination of processes taking place in the enterprise.

Third, in an open dissipative system, the outflow of entropy can balance its growth in the system itself, and therefore there is a possibility of a stationary state. If the outflow of entropy exceeds its internal growth, then large fluctuations arise and grow, reinforcing the instability at bifurcation points.

Let us prove the problems in implementing business process modeling as a component of their reengineering. Thus, the scientist-economist Gizatulin A. M. in his work [8], when studying the issue of business process management in RBP and, in particular, the issue of business process modeling, claims that a number of methodological problems arise, namely scientific contradictions regarding the following issues:

Is it possible to describe the dynamics of subprocesses using linear models?

– the dynamics of subprocesses is a stochastic or deterministic process;

Is it possible to predict the dynamics of business processes based only on internal or only on external factors?

– which theory more accurately describes the reaction of an enterprise to information updates: efficient market theory or fractal market theory;

– whether the enterprise is an equilibrium and stable system;

– the enterprise is an open or closed system;

What determines the development of an enterprise: internal contradictions, self-organization or organization through external influence, management.

However, most scientists are inclined to believe that an enterprise is a complex open dynamic system, characterized by instability, non-equilibrium, irreversibility, resonant excitation. Such characteristics of an enterprise require modeling methods to be able to take into account nonlinearity and adaptability to the laws of formation of the dynamics of enterprise development, which are constantly changing in time, to new data, to market fluctuations [8].

Let us examine the directions of the theory of self-organization of complex systems. The theory of self-organization of complex systems reveals another side of the world: its instability, nonlinearity (different variants of the future), openness, which increases the complexity of formations with their subsequent unification into an evolving whole. The manifestation of complexity in the phenomena of self-organization assumes the presence of a complex spectrum of attractor structures that exist for a narrow, unique class of models with static nonlinear dependencies. The theory of self-organization of complex systems is a fairly new direction of post-nonclassical science. But some of its fundamental provisions have already taken place in the philosophical tradition (the role of chaos in the system of the evolutionary process

is considered within the framework of ancient philosophy as a precursor of synergistic ideas). The conceptual provisions of the synergetic view of the world and its laws, which change our ideas about the sources and mechanisms of functioning of complexly organized systems, our world perception, can be traced on the example of systems theory (L. von Bertalanffy), cybernetics (N. Wiener), tectology (A. Bogdanov) and other theories. Thus, different versions of systems theory, unlike synergetic, mainly consider the processes of homeostasis, that is, the processes of maintaining the equilibrium of the system using feedback mechanisms [8]. Modern interpretations of the process of development of material and immaterial objects from the position of the theory of self-organization are characterized by the existence of a significant number of schools and directions that differ in the subject of research, mechanisms for implementing the principles of the synergetic paradigm in scientific research [3].

Let us define the principles of methodological construction of IBP systems during their reengineering. The principles of synergetics can be conditionally divided into ontological and epistemological, principles of being and principles of cognition. Ontological principles can be formulated as follows: 1) the real form of being is evolving systems; 2) any system is open, exchanges energy and information with the environment; 3) each system evolves to a more stable state (attractor); 4) the evolution of the system is always subject to the main parameters of the order, which arises as if from being itself without human participation. The final principle resembles the principle of naturalness, according to which a significant number of problems are solved not by man, but by the natural course of things, which is very often taken into account in the process of regulating actions [8].

Let us consider the stages of business modeling of processes that are being redesigned. Business modeling must go through several stages. First, modeling allows you to automate the management process during RBP, which in itself means increasing the speed of information transfer and increasing control. And this, at a minimum, facilitates the task of the manager of two management functions during RBP. Secondly, the modeled system is self-adjusting. First, an organizational model is built, which is obtained by combining the functional and structural models during RBP. As a result, we get answers to the questions: what functions does the company implement and who exactly implements them. At the next stage, input and output parameters are assigned to each function – the functions become business processes, which are then presented in the form of interdependent chains, and this is a process model. In parallel, the structural model is transformed into a role model (delegation of authority and definition of responsibility). At the stage of building a process-role model, the possibility of automation arises. The consequence of automation is the acceleration of information transfer and increased control, which will allow you to proceed smoothly to the last stage - quantitative modeling. Indeed, the share of quantitative description in different components of management varies. For example, in the production sector, up to 90% of all processes can be described using quantitative methods, while in marketing only about 10% [1].

From the point of view of determining the object component in RBP, we will study the reengineering of the financial activities of industrial enterprises in the modern conditions of the Ukrainian economy using simulation modeling (IMBP). In Western practice, the Baumol and Miller-Orr models are most widely used. The direct application of these models in domestic practice is still complicated by inflation, high discount rates, underdevelopment of the securities market, etc. [6].

The Baumol model assumes that the enterprise starts working with the maximum level of funds for it, and then gradually spends them. All funds received from the sale of goods and services are invested in short-term securities. As soon as the stock of funds is depleted, that is, equal to zero or reaches some given level of security, the enterprise sells part of the securities and thereby replenishes the stock of funds to the original value. The Miller-Orr model answers the question: how should an enterprise manage its cash supply if it is impossible to predict the daily outflow and inflow of funds. When building the model, the Bernoulli process is used - a stochastic process in which the receipt and expenditure of money from period to period are independent random events (Fig. 1) [6].

The balance of funds in the account fluctuates erratically until it reaches an upper limit. When this happens, the company begins to buy securities in order to return the cash supply to some normal level (the return point). If the cash supply reaches a lower limit, the company sells its securities and replenishes the cash supply to a normal level.

When deciding on the range of variation (the difference between the upper and lower limits), it is recommended to adhere to the following policy: if the daily variability of cash flows is large, or the costs associated with the purchase and sale of securities are large, then the enterprise should increase the range of variation, and vice versa. It is also recommended to reduce the range of variation if there is a possibility of receiving income due to a high interest rate on securities [6].

Conclusions and prospects for further scientific developments. In the course of the research carried out by the author, it is necessary to make the following conclusions, namely: the study of the methodological principles of business process modeling as a component of BPM is of considerable importance from the standpoint of studying the complex of methods for modeling business processes in BPM. The author proves that with the skillful use of methodological support for business process modeling in BPM, the efficiency of economic activity of industrial enterprises can be significantly increased. As for the prospects for scientific developments, further research is required to determine the development of subsystems for implementing business process modeling and improving the phasing of BPM based on the BPM concept and X-engineering.

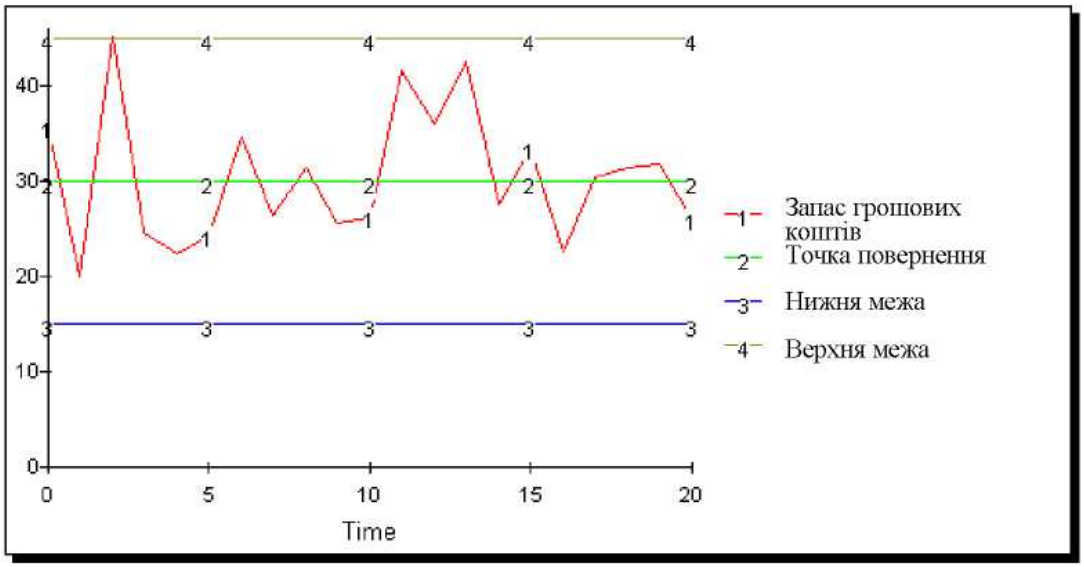

Figure 1 – Miller-Orr model [6]

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МЕТОДОЛОГІЧНІ ПРИНЦИПИ МОДЕЛЮВАННЯ БІЗНЕС-ПРОЦЕСІВ ЯК СКЛАДОВОЇ ЇХ РЕІНЖИНІРИНГУ В ДІЯЛЬНОСТІ ПРОМИСЛОВИХ ПІДПРИЄМСТВ

Лепейко Тетяна Іванівна
доктор економічних наук, професор,
Харківський національний економічний університет імені Семена Кузнеця

У статті розглядаються методологічні принципи моделювання бізнес-процесів як складової реінжинірингу в господарській діяльності, а також напрямки теорії самоорганізації складних систем. Зазначено особливості сучасної економічної системи, які визначають певні особливості управління бізнес-процесами, зокрема їх реінжинірингу. Доведено проблеми впровадження моделювання бізнес-процесів під час їх подальшого реінжинірингу. Визначено принципи методологічної побудови систем моделювання бізнес-процесів під час їх реінжинірингу. Розглянуто етапи бізнес-моделювання процесів, що перепроектуються. Досліджено реінжиніринг фінансової діяльності промислових підприємств у сучасних економічних умовах за допомогою імітаційного моделювання. Обґрунтовано використання моделей Баумоля та Міллера-Орра під час моделювання бізнес-процесів під час їх реінжинірингу. Відповідні висновки сформовані на основі наукових досліджень у рамках теми цієї статті.

Ключові слова: *моделювання бізнес-процесів, реінжиніринг бізнес-процесів, імітаційне моделювання бізнес-процесів, підприємство, синергія.*

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