

Vladimir I. Bunkovskiy¹, Alexey V. Samarukha²

PRODUCTION PROCESS MANAGEMENT WITH CONSIDERATION OF RISK COMPONENT

The article provides an overview of general aspects of process control, taking into account the risk component. The key principles of production processes arrangement under current economic conditions have been analyzed. General and specific features of the process control systems are revealed. The basic tools for minimizing and managing risks in enterprises' activities are presented.

Keywords: production process; production process management; risks.

Володимир Й. Буньківський, Олексій В. Самаруха

УПРАВЛІННЯ ВИРОБНИЧИМ ПРОЦЕСОМ З УРАХУВАННЯМ РИЗИКОВОЇ СКЛАДОВОЇ

У статті розглянуто загальні аспекти управління виробничим процесом з урахуванням ризикової складової. Проаналізовано основні принципи організації виробничих процесів у сучасних економічних умовах. Виявлено загальні та специфічні риси системи управління виробничими процесами. Представлено основний інструментарій мінімізації і нейтралізації ризиків у діяльності підприємств.

Ключові слова: виробничий процес; управління виробничим процесом; ризики.

Табл. 1. Рис. 3. Літ. 10.

Владимир И. Буньковский, Алексей В. Самаруха

УПРАВЛЕНИЕ ПРОИЗВОДСТВЕННЫМ ПРОЦЕССОМ С УЧЕТОМ РИСКОВОЙ СОСТАВЛЯЮЩЕЙ

В статье рассмотрены общие аспекты управления производственным процессом с учетом рисковой составляющей. Проанализированы основные принципы организации производственных процессов в современных экономических условиях. Выявлены общие и специфические черты системы управления производственными процессами. Представлен основной инструментарий минимизации и нейтрализации рисков в деятельности предприятий.

Ключевые слова: производственный процесс; управление производственным процессом; риски.

Introduction. Within the contemporary economic environment, Russian manufacturers largely depend on the development of high-technology production in achieving competitive advantage. This is especially critical for the strategic sectors of national economy, which determine, to a large extent, the country's production and talent pool potential.

In addition, actions to resolve the issues of product quality assurance must receive priority in setting up new production. Different methods and tools of production processes implementation are used to accomplish this goal in companies of different industries and areas of activity. For instance, mechanical engineering companies rely on control as the main method of quality assurance, mainly targeted to prevent production defects through prompt detection and elimination of root causes of defects and establishing global responsibility for quality of processes and products.

¹ Irkutsk State Technical University, Russia.

² Baikal State University of Economics and Law, Irkutsk, Russia.

At the same time, uncertainty of conditions, unique nature of production processes, lack of industrial production experience in implementation and use of high-technology equipment – all these factors considerably increase the probability of various risk types, primarily, production and financial ones. In this regard, development of an integrated approach to production process management in consideration of risk component acquires special significance.

Recent research and publications analysis. Issues related to production improvement, quality assurance of processes and products, organization of management processes in a production system are among the priority development fields for companies of different industries. Numerous studies by foreign and Russian authors were dedicated to theoretical and practical aspects of production processes management, including the consideration of risk components, among which are the following: Y.P. Adler and S.E. Schepetova (2002), S.V. Amelin (2008), B. Andersen (2003), M.A. Bendikov (2000), L.P. Goncharenko (2006), P. Druker (2002), I.V. Kablashova (2006), L.P. Pidoimo (2004), A.S. Nechaev and A.V. Basova (2013) and others. Nevertheless, these studies do not contain an integrated approach to production process management with consideration of risk component.

This research objective is to study the organization principles of production processes, integrating them into one system, taking into account the component of risks.

Key research findings.

Research of production processes organization principles. As a rule, production process is an integrity of interrelated processes of labor, where the object of labor is subjected to physical, chemical and biochemical treatment with the purpose to obtain a finished product.

Furthermore, production process is subdivided into main, auxiliary and service processes. The common feature for production process of any type is being composed of two stages: main and auxiliary. The main process, being a part of the overall production process, is related to product manufacture. Auxiliary processes are used to support failure-free progress of main processes, while the result of auxiliary processes is the products used within the enterprise itself. Auxiliary processes include equipment repair, gear manufacture etc. Service processes are the processes, which provide services required for normal functioning of both main and auxiliary processes. These include transportation, warehousing, parts selection, batching etc.

It is worth mentioning that under current conditions of production automation, main and service processes tend to integrate. Meanwhile, the composition and interrelations of main, auxiliary and service processes form the structure of production process.

At the same time, in terms of organization, production processes are classified into simple processes composed of a consecutive series of actions on a simple object of labor (e.g., production process of manufacturing a single part of a batch of identical parts), and complex processes, which are a combination of simple processes performed on a series of labor objects.

Auxiliary processes implemented by setting up auxiliary shops, services or stations do not affect the product immediately.

Production processes may also be classified into synthetic, where a single type of product is obtained from several types of raw materials; analytical – the processes, which separate the product into its components; and direct – one type of raw material per one product type.

In relation to labor or technology, any production process may be further divided into different operations, which are, in turn, composed of individual elements. Therefore, production process is a complex process of labor, which requires management at all stages of organization.

Organization of any production process must be based on the following principles (Figure 1).

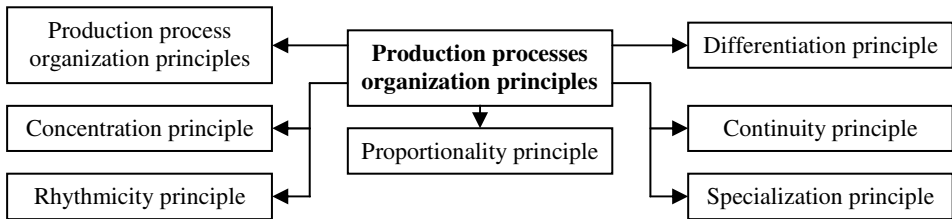


Figure 1. **Production processes organization principles**, compiled by the authors

The differentiation principle suggests separation of production process into individual parts (processes, operations), and their allocation to corresponding divisions of an enterprise. This principle is opposed to the principle of combination, which signifies complete or partial consolidation of diverse processes of manufacturing of particular product types within a single station, shop or production facility. Depending on complexity of a product, production volume and the nature of equipment used, production process may be concentrated in any particular production division (shop or station), or spread over several divisions. For instance, mechanical engineering enterprises producing considerable quantities of similar products tend to set up standalone mechanical and assembly production facilities and shops, while companies with smaller product lots may set up consolidated mechanical assembly shops.

When deploying principles of differentiation and consolidation, practical organization of production should prioritize the principle, which provides the best economic and social characteristics of the production process.

The concentration principle designates clustering of particular production operations related to manufacturing of technologically homogeneous products or completion of functionally homogeneous works at particular workplaces, stations, shops or production lines of an enterprise. Feasibility of concentrating homogeneous works in particular production areas is determined by a set of factors, including common process methods, which require using similar type of equipment; capacity of equipment; growth of production volume of particular product types; economic feasibility of concentrating the manufacturing of particular product types or performance of particular homogeneous works. Advantages of each kind must be taken into consideration when selecting one or another direction of concentration.

The specialization principle is based on limiting diversity of production process elements. Implementation of this principle assumes the allocation of a strictly delimited range of works, operations, parts or assemblies to each particular work place and each division. Contrary to the specialization principle, the principle of versatility sug-

gests the organization of production, where each work place or production division produces parts or assemblies of a wide item range, or performs diverse production functions.

The proportionality principle suggests consistent combination of individual elements of production, expressed as a particular quantitative ratio to one another. In this way, proportionality of production capacity presumes equal capacity of production areas or equipment load. In this case, capacity of prefabricated product shops corresponds to demand for prefabricated products at mechanical shops, while throughput capacity of the latter depends on the demand of parts at assembly shop. This stipulates the need to provide each shop with an amount of equipment, area and workforce, which enables proper operations of all divisions of an enterprise. Similar ratio of throughput capacity must also exist between the main production, on the one side, and auxiliary and service divisions on the other.

The rhythmicity principle implies that all individual production processes and the consolidated manufacture process of a particular product type are repeated every particular period of time. This principle suggests uniform product output and production process progress.

The continuity principle is implemented in such forms of production process organization, where all operations are performed continuously, without interruptions, while all objects of labor gradually move from one operation to another. This principle of production is fully implemented in automatic or continuous flow lines used in manufacturing or assembling, with operation duration of equal or multiple of the line tact (Nechaev and Antipin, 2014).

It is apparent that the principles reviewed above must serve as the basis for building an efficient management system for corporate production processes.

Analysis of a production process management system. Specific nature of managing production process under contemporary economic conditions is determined by several factors shown in Figure 2.

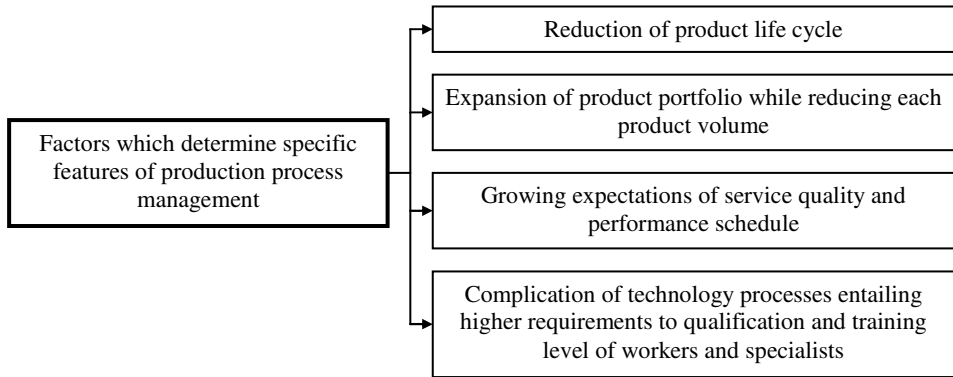


Figure 2. **Factors which determine specific features of production process management under contemporary economic conditions,**
compiled by the authors

In addition, contemporary management systems are distinguished by the set of indicators listed in Table 1.

Table 1. Indicators distinguishing contemporary systems of production process management, compiled by the authors

Key indicators distinguishing contemporary systems of production process management	- existence of smaller divisions with fewer workers of higher qualification;
	- minimum number of management levels;
	- creation of organizational structures based on specialist groups;
	- building schedules and production programs targeted at customer demands;
	- keeping minimum warehouse stocks;
	- immediate reaction to changes in internal and external environment;
	- existence of rapid change-over equipment;
	- high labor efficiency and low labor costs;
	- high quality of finished products and orientation at precise connections with customers.

Surely, management of production process at an enterprise depends on particular structures of a particular enterprise, and building method of a company's functional system. Building of management system must incorporate the nature of production, conditions of procurement and sales; material aspect of production and nature of staff involvement; individual factors, such as product quality, costs etc.

For instance, given the centralized method, all management functions are concentrated at functional departments of plant's management. Only line managers are left at shop or station levels. In order to bring the functional departments closer to production, part of this administration may be relocated to shops, which it immediately services. Nevertheless, administrative staff remains subordinated to manager of the general functional department of an enterprise. Centralized system is appropriate for smaller production volumes mostly, although it remained widely spread throughout the previous century in Russia.

In case of a decentralized management method, all functions are handed over to shops. Each shop turns into a closed production division.

The most efficient method used by majority of companies is the mixed one. Under this method, issues which can be most promptly and better resolved at the level of economic unit are handed over to that level, while methodological management of functional division and product quality control remains with functional departments of enterprise management.

Since the bulk of production process occurs immediately in shops, the latter is provided with its own production process management staff. The shop is headed by a highly qualified worker, who reports to enterprise director. His authority includes labor organization of the entire staff, production process mechanization and automation, implementation of new equipment, deployment of labor safety measures. At the same time, to accomplish particular technical and economic tasks, a large shop may be provided with other structural division, e.g. technical bureau dealing with improvement of production technology, providing assistance to individual work stations in implementation of new production technologies, and supervising technology compliance; production dispatching bureau in charge of operational production planning and production process management; the shop's chief mechanic group providing equipment maintenance and repair.

Therefore, production process management at an enterprise is an integrated process based on a set of mandatory principles. Meanwhile, production processes

management methods overall correspond to general organization methods, although they have specific features determined by particular details of production.

It is worth noting that the efficiency of production process management under contemporary economic conditions to a large extent depends on the efficiency of risks identification and minimization.

Development of an integrated approach to production process management with consideration of risks. Economic publications enumerate a substantial quantity of risk types, which may occur in the course of operation of any enterprise regardless the form of ownership, activity area etc.

The most widespread causes of risks occurrence include, firstly, reduction of planned production volume and equipment sale due to labor efficiency decline, equipment downtime, work time loss, lack of required quantity of input materials, high percentage of rejected finished products.

Second, this includes price fall, at which the company intended to sell the product (service) due to its insufficient quality, unfavorable changes in market environment, the decline of demand.

Third, the increase of material costs due to excessive consumption of materials, raw materials, fuel, energy, increase of transportation costs, sales costs, overhead and other additional costs.

Fourth, growth of payroll costs due to staff count in excess of planned or payment of higher salaries than planned to particular staff members.

Fifth, larger tax and other payments of the enterprise.

Sixth, low discipline of supplies, interruptions of fuel and power supply, physical wear and obsolete condition of equipment etc.

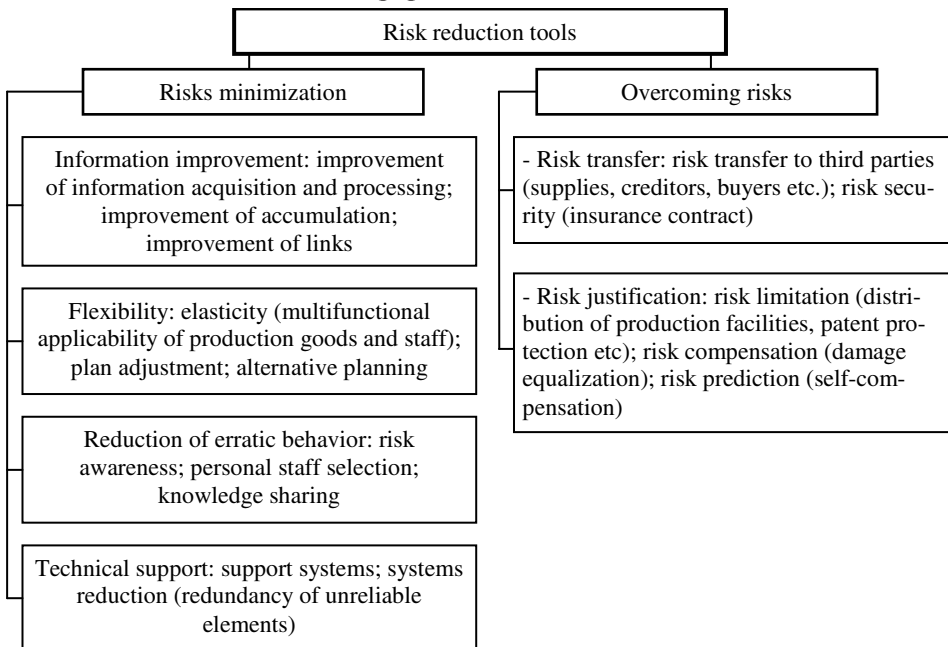


Figure 3. Instruments to reduce impact of production process risks, compiled by the authors

The need to use various tools to reduce the effect of risks onto production processes becomes especially important (Figure 3).

Efficiency of risks management mainly depends on the speed of reaction to changing market conditions, economic situation, financial standing of an enterprise. Therefore, high significance should be attributed to selection of risk management methods, the ability to evaluate particular economic situation quickly and adequately, the ability to find optimal solution promptly.

Conclusion. Contemporary processes of product manufacturing typically mingle main, auxiliary and service processes, while auxiliary and service processes tend to occupy yet greater space within the overall production cycle. This occurs due to common delay of mechanization and automation of production maintenance vs. available assets of main production processes. Regimenting of technology and organization of completion of not only main, but also auxiliary and service production processes becomes yet more critical in these conditions. Efficiency of production processes largely depends on the quality of decision-making, manager's choice in minimization and avoidance of risks in production activity.

References:

- Андерсен Б.* Бизнес процессы. Инструменты совершенствования. – М.: Стандарты и качество, 2003. – 272 с.
- Бендииков М.А.* Экономическая безопасность промышленного предприятия в условиях кризисного развития // Менеджмент в России и за рубежом. – 2000. – №2. – С. 17–30.
- Гончаренко Л.П.* Управление рисками. – М.: КноРус, 2006. – 216 с.
- Друкер П.Ф.* Задачи менеджмента в XXI веке. – М.: Вильямс, 2004. – 272 с.
- Пидоймо Л.П.* Модернизация промышленных предприятий: Концептуально-методологические основы, ключевые факторы, система планирования: Монография. – Воронеж: Воронеж. гос. ун-т, 2004. – 208 с.
- Adler, Y.P., Schepetova, S.E.* (2002). Process Business Description. Quality Management Methods, 2: 52–59.
- Amelin, S.V.* (2008). Production Management Organization Based on Modeling. Production Organizer, 2: 93–96.
- Kablashova, I.V.* (2006). Implementation of the Concept of Process Approach to Production Organization. Economics and Production, 3: 55–58.
- Nechaev, A.S., Antipin, D.A.* (2014). Financial and tax instruments for stimulation of enterprises innovative activity. Problems and Perspectives in Management, 2: 173–180.
- Nechaev, A.S., Basova, A.V.* (2013). Taxation as an instrument of stimulation of innovation-active business entities. World Applied Sciences Journal, 22(11): 1544–1549.

Стаття надійшла до редакції 26.01.2015.