



**The analysis of algorithms of adoption of basic administrative decisions at Industrial
Enterprises**

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ABSTRACT

We can define four basic management decisions at the industrial enterprise: increase in output of manufactured products, production of new products, modernization of production business processes, modernization of technologies that support business processes. Each of these decisions should be economically justified. The justification of modernization of technologies for the implementation of business processes at an industrial enterprise is based on the business plans for the investment projects. The rationale for modernization of the technologies of the main (production) business processes is not complicated, the calculations of project efficiency indicators are based primarily on the linear dependencies. The rationale for modernization of the technologies of auxiliary (supporting) business processes is more complex. Firstly, all the auxiliary business processes are linked together into a single network, which means that changing the technologies of a single business process can have an impact on the related business processes and the entire network. Secondly, it is necessary to take into account closed economic cycles of interrelations between the auxiliary business processes. Thirdly, the technologies of implementing the auxiliary business processes are rarely modeled at the industrial enterprises, as a result, they are a "black box" for the decision-makers. These specific features complicate the economic justification of the modernization projects for the technologies of auxiliary business processes. The following key factors make influence on making the management decision on the additional release of already produced products or the organization of production of new products: the level of loading the technological capacities; the capacity of the market segment of the product planned for production; the need for additional equipment, personnel, working capital and the cost of these resources. Based on the decision made, an enterprise should receive a competitive advantage in the form of additional profit; cost reduction; increase in market share; receipt of additional technological capabilities and competencies. The management decision is made on the basis of calculations of the main indicators of the investment project and business plan.

Key words: investment project, industrial enterprise, main business process, auxiliary business process, modernization, product policy.



1. INTRODUCTION

All business processes of an enterprise are divided into basic (production) and auxiliary on the basis of added value to marketable products (Hammer, M., Ciampi, J. (1993), Harmon, P. (2014)). The implementation of basic business processes is carried out by equipment, tools, inventory, etc. (that is, the basic production assets). The auxiliary business processes ensure the normal functioning of the main production, have specific technologies for performing their subprocesses and business functions (Mahal, A. (2010), Brimson, D. (2007)). The modernization of technologies for performing the business processes is understood as improving the specifications of functioning equipment by partially replacing its individual nodes with more sophisticated ones or purchasing a new one.

2. TEXT OF ARTICLE

Managerial decisions on modernization of technologies of the main and auxiliary business processes.

When it comes to modernization in an enterprise, as a rule, the main focus is on the main business processes. There are usually no problems with the rationale for modernization of the technologies of the main (production) business processes, the calculations of project efficiency indicators are based primarily on the linear dependencies (Burlton, R. (2001), Chernjavskij, D.I. (2010)). Calculation of the economic effect from the implementation of the project modernization is formed by saving material and labor resources, reducing the time of technological downtimes, automating some part of the production processes, making profit (Luskatova, O.V. (2011)). When analyzing the feasibility of investing resources in production modernization projects, the following performance indicators are considered (Kurenkova, V.P. (2006)):

1. The net present value of the project (*NPV*) - the amount of money received by the investor from the project implementation, net of investment costs.

$$NPV = \sum_{k=1}^n \frac{P_k}{(1+r)^k} - IC$$

P_k – net cash flow in the k -th year, million roubles;

r – discount ratio;

n – project duration, years;

IC – investment costs, mln. roubles.

2. Internal rate of return of the project (*IRR*) – this is the value of the discount ratio at which the net present value of the project will be equal to zero.



$$NPV = \sum_{k=1}^n \frac{P_k}{(1 + IRR)^k} - IC = 0$$

3. Return on investment (*RI*) – this is the ratio of net present value of the project to investment costs.

$$PI = \frac{NPV}{IC}$$

4. Discounted payback period of the project (*DPBP*) – this is the time period through which the resources invested in the project will be returned to the investor taking into account inflation, that is, the following condition is fulfilled:

$$\sum_{k=1}^{n_{DPBP}} \frac{P_k}{(1 + r)^k} \geq IC$$

n_{DPBP} – the time period, in which the above inequality becomes fair.

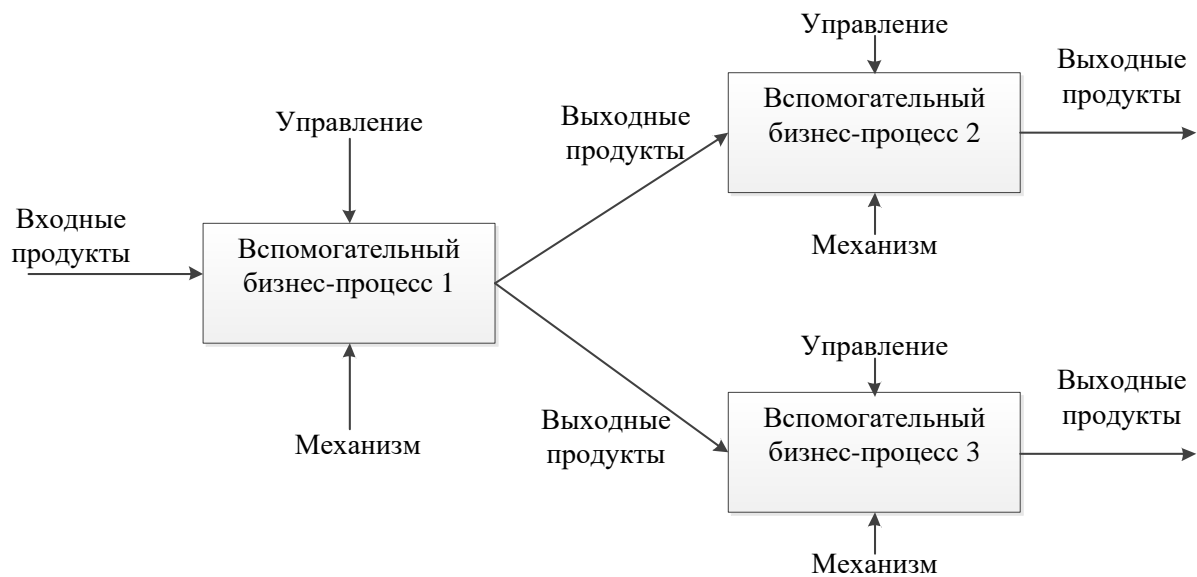
The main factors of the modernization of production capacities are:

1. Moral or physical wear and tear of equipment. Moral wear and tear is associated with the emergence of more sophisticated and productive equipment, reflects the influence of scientific and technical progress on the basic production assets. At the same time, the duration of the life cycle of production capacities in the engineering industry is from 4 to 10 years according to different data (Rummler, A.G., Brache, A.P. (2012), Palihata, V.M. (2011)).

2. The need for equipment to implement the production plan.

The problems are more significant with an economic justification of modernization of the technologies of auxiliary (supporting) business processes. Firstly, the technologies of implementing the auxiliary business processes are rarely modeled at the industrial enterprises, as a result, they are a "black box" for the decision-makers (Harrington, D. (2002), Abdikeev, N.M., Danko T.P., Ildemenov A.D., Kiselev A.D. (2005)).

Secondly, all the auxiliary business processes are linked together into a single network, which means that changing the technologies of a single business process can have an impact on the related business processes and the entire network (Karamyshev, A.N. (2016)).

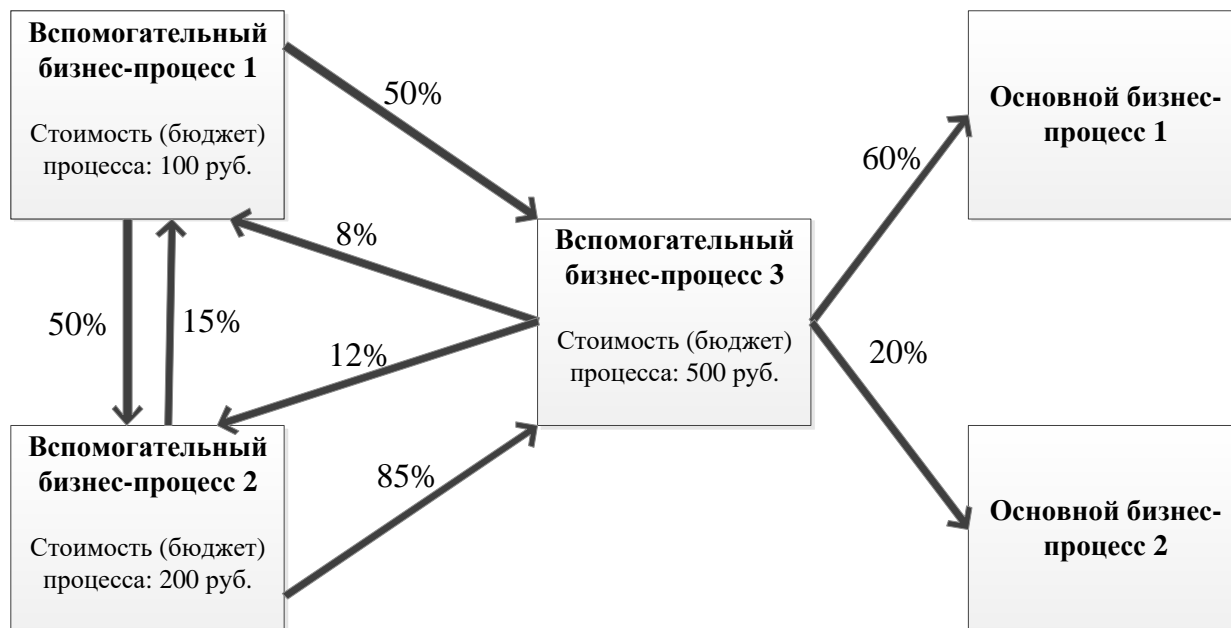


Входные продукты	Input products
Управление	Management
Вспомогательный бизнес-процесс 1, 2, 3	Auxiliary business process 1, 2, 3
Механизм	Mechanism
Выходные продукты	Output products

Fig. 1. Generalized model of interrelations of the auxiliary business processes

Modernization of technologies of the auxiliary business processes (Fig. 1) can be aimed at the mechanisms for executing the business process or managing them. One of the possible results of modernization may be a reduction in the demand for products of business processes-suppliers throughout the business process network. This saving of resources should be taken into account when calculating the economic efficiency of the project (Karamyshev, A.N. (2017)).

Thirdly, it is necessary to take into account closed economic cycles of interrelations between the auxiliary business processes. Each auxiliary business process has a budget cost that is calculated on the basis of the cost estimate, as well as receives the products from related auxiliary business processes. The nature of economic relationships between the auxiliary business processes is cyclical. A conditional example of the cost distribution of the auxiliary business processes (Fig. 2) shows closed cycles of relationships between the auxiliary business processes (Karamyshev, A.N. (2017)).



Вспомогательный бизнес-процесс 1, 2, 3	Auxiliary business process 1, 2, 3
Стоимость (бюджет) процесса	Cost (budget) of the process
руб.	roubles
Основной бизнес-процесс 1, 2	Main business process 1, 2

Fig. 2. Conditional example of closed economic relationships of the auxiliary business processes

It is also necessary to take into account the possible negative impact of auxiliary business processes on production. It is manifested in the untimely start-up of technological equipment or its insufficient workload due to poor quality of the auxiliary business processes. The analysis of negative impact should be carried out using the methods of network planning and management; it is necessary to assess its consequences - by adjusting the production plans and calculating possible losses or lost profits. All supporting subprocesses that negatively affect the main business processes should be recognized as significant and it is necessary to work on their improvement and stability of implementation.

These specific features complicate the economic justification of the modernization projects for the technologies of auxiliary business processes.

In order to take into account all the above factors when making a managerial decision on the advisability of modernization of technology of the auxiliary business process, we suggest using the following model (Fig. 3).



Начало	Start
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Моделирование вспомогательных бизнес-процессов	Modeling of the auxiliary business processes
Определение значимости каждого из вспомогательных бизнес-процессов (ВБП)	Determining the importance of each of the auxiliary business processes (ABP)
да	yes
нет	no
ВБП значимый?	Is the ABP significant?
Составление перечня значимых вспомогательных бизнес-процессов	Creation of the list of significant auxiliary business processes
Составление перечня незначимых вспомогательных бизнес-процессов	Creation of the list of non-significant auxiliary business processes
ВБП влияет на временные сроки начала или продолжительности выполнения основного БП?	Does the ABP affect the terms of the start or duration of the main BP?
Определение потерь от негативного влияния на основные бизнес-процессы	Determination of losses from the negative impact on the main business processes
Оценка эффективности инвестиционного проекта модернизации технологий ВБП с учетом устранения потерь от негативного влияния на основные бизнес-процессы и экономии ресурсов смежных вспомогательных бизнес-процессов-поставщиков	Evaluation of the efficiency of the investment project for modernization of the ABP technologies, taking into account the elimination of losses from the negative impact on the main business processes and saving resources of related auxiliary business processes-suppliers
Оценка эффективности инвестиционного проекта модернизации технологий ВБП и экономии ресурсов смежных вспомогательных бизнес-процессов-поставщиков	Evaluation of the efficiency of the investment project for modernization of the ABP technologies and saving resources of related auxiliary business processes-suppliers
Инвестиционный проект выгоден для предприятия?	Is an investment project profitable for an enterprise?
Реализация инвестиционного проекта	Implementation of the investment project
Отказ от реализации проекта	Refusal to implement the project



Окончание	End
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Fig. 3. The decision-making model on modernization of technologies of the auxiliary business process (author's development)

3. MANAGERIAL DECISIONS ON EXPANDING THE RANGE AND INCREASING THE OUTPUT OF ALREADY PRODUCED PRODUCTS.

Such managerial decisions are made on the basis of the business plan of the investment project, which should contain information on the following main issues:

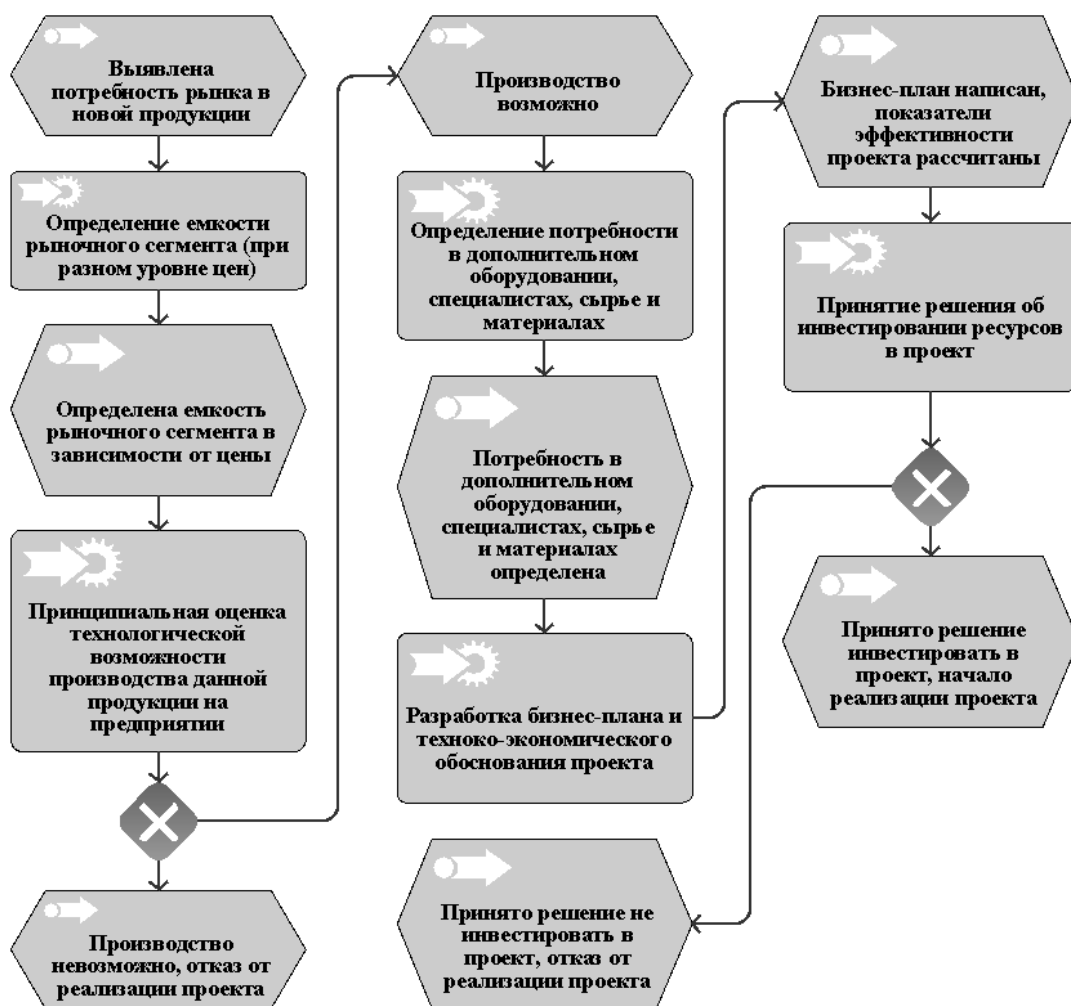
- volume of sales. It is determined on the basis of marketing research, during which it is collected the information on the market segment capacity, the level of competition on it, the competitive positions of the enterprise and its products, the prices and pricing policies of competitors, the dynamics of the market segment and trends there.
- level of competitiveness of the products produced.
- analysis of technological capacities of the enterprise. It is estimated the competitiveness of production technology, the achieved level of equipment loading, and the qualification of basic workers.
- the need for equipment modernization and purchase of additional technological capacities. It is determined based on the analysis of technological capacities and production plans.
- the need for additional working capital, the sources of its formation and the value of this capital for the enterprise. As a rule, the enterprises attract the resources of credit institutions to finance additional working capital.
- availability of labor resources for the project implementation and additional need for them.
- analysis of warehouse capacities of the enterprise and definition of additional demand for them.
- analysis of transport capacities of the enterprise and the possibility of attracting additional ones. It is estimated the level of use of the automotive equipment.
- economic feasibility. It is calculated the above indicators of the investment project.

Based on the above information, we will form the following generalized decision-making models on release of the new (Fig. 1) and additional release of the products produced (Fig. 2):



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Выявлена потребность рынка в новой продукции	The market demand for new products is revealed
Определение емкости рыночного сегмента (при разном уровне цен)	Determination of the market segment capacity (for different price levels)
Определена емкость рыночного сегмента в зависимости от цены	The market segment capacity depending on the price is determined
Принципиальная оценка технологической возможности производства данной продукции на предприятии	Basic evaluation of the technological feasibility of production of this product at the enterprise
Производство невозможно, отказ от реализации проекта	Production is impossible, refusal to implement the project
Производство возможно	Production is possible



Определение потребности в дополнительном оборудовании, специалистах, сырье и материалах	Determination of the need for additional equipment, specialists, raw materials and materials
Потребность в дополнительном оборудовании, специалистах, сырье и материалах определена	The need for additional equipment, specialists, raw materials and materials is determined
Разработка бизнес-плана и технико-экономического обоснования проекта	Development of a business plan and a feasibility study of the project
Принято решение не инвестировать в проект, отказ от реализации проекта	It is decided not to invest in the project, refusal to implement the project
Бизнес-план написан, показатели эффективности проекта рассчитаны	The business plan is written, the project efficiency indicators are calculated
Принятие решения об инвестировании ресурсов в проект	Decision on investing resources in the project
Принято решение инвестировать в проект, начало реализации проекта	It is decided to invest in the project, start of the project implementation

Fig. 1. Generalized algorithm for making decision on the release of new products

Let us consider separate stages of the algorithm in Figure 1.

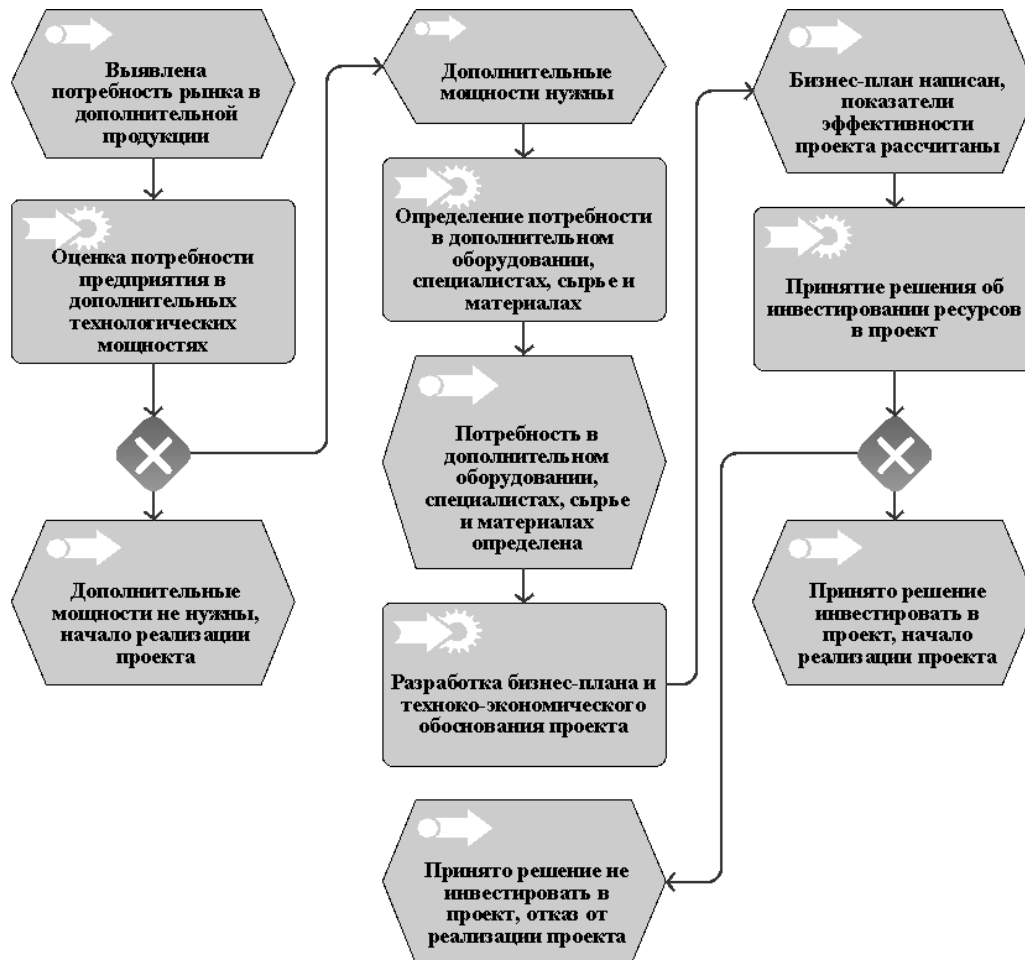
The stage of "Basic evaluation of the technological feasibility of production of this product" assumes an expert analysis of the technological capabilities of the enterprise in the market segment new for it, as well as the availability of competent specialists capable of developing, testing and producing marketable products.

The stage of "Decision on investing resources in the project". As a rule, the decision to invest money in upgrading and increasing technological capacities is taken by the Director General or the company's owner. For this reason, the decision is subjective in many ways.



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Выявлена потребность рынка в дополнительной продукции	The market demand for additional products is revealed
Оценка потребности предприятия в дополнительных технологических мощностях	Evaluation of the enterprise's need for additional technological capacities
Дополнительные мощности не нужны, начало реализации проекта	Additional capacities are not needed, start of the project implementation
Дополнительные мощности нужны	Additional capacities are needed
Определение потребности в дополнительном оборудовании, специалистах, сырье и материалах	Determination of the need for additional equipment, specialists, raw materials and materials
Потребность в дополнительном оборудовании, специалистах, сырье и материалах определена	The need for additional equipment, specialists, raw materials and materials is determined



Разработка бизнес-плана и технико-экономического обоснования проекта	Development of a business plan and a feasibility study of the project
Принято решение не инвестировать в проект, отказ от реализации проекта	It is decided not to invest in the project, refusal to implement the project
Бизнес-план написан, показатели эффективности проекта рассчитаны	The business plan is written, the project efficiency indicators are calculated
Принятие решения об инвестировании ресурсов в проект	Decision on investing resources in the project
Принято решение инвестировать в проект, начало реализации проекта	It is decided to invest in the project, start of the project implementation

Fig. 2. Generalized algorithm for making decision on the release of additional products

The algorithms of Figures 1 and 2 are similar in many respects. Let us consider separate original stages of the algorithm in Figure 2.

If an enterprise does not need additional technological capacities to increase the output of its products, this indicates that the equipment is not fully loaded. More full production capacity utilization allows: a) increasing the efficiency of using the plant production assets; b) reducing the cost price of a unit of manufactured products in terms of overhead costs, since the additional output leads to the allocation of a portion of fixed costs to it. The understanding of this is a stimulating factor for a more complete utilization of the enterprise's production capacities.

According to the author the following points remain beyond the framework of economic calculations:

1. Decision on upgrading or modifying the main or auxiliary business process using the above algorithms is local and is carried out on the basis of a business plan. However, since all business processes of an enterprise are integrated into a single network and connected by the products transferred by the business processes (that is, the object communication), any local decision on modifying one business process is reflected in the entire business process network.
2. The nature of the economic interrelationships providing business processes among themselves often represents closed contours, which leads to the need to carry out a multi-cycle transfer of the cost of auxiliary business processes to the cost price of production.



3. Possibilities of the auxiliary business processes to provide the processes-consumers with necessary input resources, taking into account an increase in production volumes. In case of impossibility of qualitative maintenance of processes-consumers, the processes-suppliers should be equipped with necessary means of production; the expenses for their acquisition should be considered at making the administrative decision.

From our point of view, these factors should be taken into account when calculating the economic efficiency of the management decisions planned. Since the existing methods, methodologies and algorithms do not allow this, we consider it necessary to improve the existing toolkit.

4. METHODS

During the study, the author used the following methods:

1. Selective analysis of specialized literature with a high citation index for the subject matter indicated in the title of this article. In particular, we considered four basic management decisions: increase in output of manufactured products, production of new products, modernization of production business processes, modernization of technologies that support business processes.
2. The array of information was systematized for the purpose of further analysis. In particular, we considered the algorithms of making these management decisions.
3. We carried out an analysis of the collected information with the purpose of revealing the merits, shortcomings of the methods considered and assessing the possibility of their practical application.
4. The study results were given the author's interpretation, and the appropriate conclusions were drawn.

5. RESULTS

1. The economic justification of modernization of the auxiliary business processes is more complex than production ones for the following reasons:

- a) lack of a systemic understanding of the types of activities carried out in the auxiliary business processes;
- b) the need to take into account the impact of modifying the technologies of implementation of the auxiliary business processes on the entire network of business processes;
- c) the need to take into account closed economic cycles of interrelations between the auxiliary business processes;



d) the need to take into account the risks of negative impact of auxiliary business processes on the investment project and production processes.

In order to take into account these factors, we developed a decision-making model on modernization of technologies of the auxiliary business process. In order to practically implement the model presented at the enterprise, it is necessary to formalize it in the form of a methodology.

2. The main factors influencing the adoption of the management decision on expanding the range and production volumes include the market capacity, the level of competitiveness of the products produced, the technological capabilities of the enterprise, the need for additional working capital, storage and transportation capacities, the availability of labor, material, financial resources for the project, as well as the economic feasibility.

3. The economic feasibility of a management decision is determined on the basis of a feasibility study for a particular project. The main economic indicators are the net present value of the project, the discounted payback period, the internal rate of return.

4. The following important points are not taken into account when conducting economic calculations for making decisions on expanding the range and increasing production volumes:

a) the impact of a local management decision on the ultimate efficiency of the business process network; b) the complex nature of economic relationships between the auxiliary business processes; c) the need for additional equipment with production facilities of the supporting business processes. We consider it necessary to improve the existing toolkit, taking into account these factors.

6. DISCUSSION

It should be noted that the algorithms of making managerial decisions described in the article are debatable and can be supplemented by various specific factors. The author's goal was to show the generalized algorithms for making managerial decisions in order to identify possible common problems of existing management methods. From our point of view, the identified problem of not taking into account the complex nature of economic relationships between the auxiliary business processes is one of such important problems.

7. CONCLUSIONS

We can define four basic management decisions at the industrial enterprise: increase in output of manufactured products, production of new products, modernization of production business processes, modernization of technologies that support business processes. We considered the algorithms of making these management decisions in the article. Their main disadvantage is



not taking into account the complex nature of economic relationships between the auxiliary business processes and the influence of local management decision on the ultimate efficiency of the business process network. We consider it necessary to improve the existing toolkit, taking into account these disadvantages.

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9. BIBLIOGRAPHY

- Abdikeyev, N.M., Danko T.P., Ildemenov A.D., Kiselev A.D. (2005). Reengineering of Business Processes. M.: EKSMO.
- Brimson, D. (2007). Process-Oriented Budgeting. Introduction of a New Tool for Managing the Company's Value. M.: Vershina, 2007.
- Burlton, R. (2001). Business Process Change. Profiting From Process. NY: Sams.
- Chernjavskij, D.I. (2010). Modeling and Reengineering of Business Processes. Omsk: Publishing House of the OmGTU.
- Hammer, M., Ciampi, J. (1993). Reengineering the Corporation: a Manifesto for a revolution in the business. London, N B.
- Harmon, P. (2014). Business Process Change. NY: Morgan Kaufmann.
- Harrington, D. (2002). Optimization of Business Processes. Documenting, Analysis, Management, Optimization. M.: Azbuka.
- Karamyshev, A.N. (2016). Evaluation of the Impact of Modern Equipment on the Main Business Processes of Russian Machine-Building Enterprises. Belgorod: Bulletin of the BGTU named after V.G. Shuhov. No. 11.
- Karamyshev, A.N. (2017). Algorithm for Completing Multi-Cycle Attribution of the Cost of Auxiliary Subprocesses to the Main Business Processes of an Industrial Enterprise. Belgorod: Bulletin of the BGTU named after V.G. Shuhov. No. 2.



- Karamyshev, A.N. (2017). Principle of Multi-Cycle Attribution of the Cost of Auxiliary Business Processes to the Cost Price of the Products of Large Industrial Enterprises. Belgorod: Bulletin of the BGTU named after V.G. Shuhov. No. Kurenkova, V.P. (2006). Formation of the Financial Plan Sections of the Business Plans of the Enterprises. Samara: SGAU.
- Luskatova, O.V. (2011). Modern Problems of Business Process Reengineering. Vladimir: Publishing House of the VIGU.
- Mahal, A. (2010). How Work Gets Done: Business Process Management, Basics and Beyond. New Jersey: Technics Publications, LLC.
- Palihata, V.M. (2011). Management of Balanced Development of Innovation and Investment Cycles at the Power Engineering Enterprises. Nizhny Novgorod: Nizhny Novgorod State University of Architecture and Civil Engineering.
- Rummler, A.G., Brache, A.P. (2012). Improving Performance: How to Manage the White Space on the Organization Chart. NY: John Wiley & Sons.