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MODELING OF PRODUCTION PROCESSES PARAMETERS OF INDUSTRIAL ENTERPRISES

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Abstract

Corporative industrial firms' enterprises for organizationally-technical and economic measures on product competitiveness improvement realization require creating low-cost and resource-saving mechanisms. An important role in this mechanism is to allow for wide searching and systematic internal reserves to economize production, assessing and choosing variants of improving constructions, technologies, and ways to organize production. Identifying economically stimulating operators allows for firms to participate in measures and elaborations realization. Because of the role of economic analysis in production management growth, practical interest in these analysis methods is relevant at all management levels, from brigades to enterprise directors. A comprehensive information model of enterprise management tasks was formed. Statistical modelling of the production process parameters of industrial enterprises based on a single balance sheet model is characterized by system integration based on a single information base and software. The developed model makes it possible to assess the state of the production process of the enterprise and to increase the efficiency of using the results of economic analysis in the preparation and implementation of several levels of production plans, and, as a result, to increase the level of assessment of the realism of the implementation of the established production plans.

Keywords: modelling, production process, parameters, economic analysis

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МОДЕЛИРОВАНИЕ ПАРАМЕТРОВ ПРОИЗВОДСТВЕННЫХ ПРОЦЕССОВ ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЙ

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Аннотация

Реализация организационно-технических и экономических мероприятий предприятий по повышению конкурентоспособности выпускаемой продукции требует создания противозатратного и ресурсосберегающего механизмов. Важная роль в этом механизме отводится широкому и систематическому поиску внутренних резервов экономии в производстве, оценке и выбору вариантов совершенствования конструкций, технологий и способов организации производства, экономическому стимулированию исполнителей, участвующих в реализации мероприятий и разработок. В связи с этим возрастает роль экономического анализа в управлении производством, повышается практический интерес к внедрению его методов на всех уровнях управления, начиная от участков и бригад до директоров предприятий. Сформирована комплексная информационная модель задач управления предприятием. Статистическое моделирование параметров производственных процессов промышленных предприятий на базе единой балансовой модели отличается системной интеграцией на базе единой информационной базы и программного обеспечения. Разработанная модель позволяет оценить состояние производственного процесса предприятия и повысить эффективность использования результатов экономического анализа при составлении и реализации нескольких уровней производственных планов и, как следствие, повысить уровень оценки реалистичности выполнения установленных производственных планов.

Ключевые слова: моделирование, производственный процесс, параметры, экономический анализ

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1. Introduction

Economic analysis, as one of the basic management functions, realises the same tasks as the whole management system and is in close link with other functions: planning, accounts, and regulation. Considering these links allows us to determine the role of analysis in the management process.

Economic analysis is the most important element of industrial firms' research object development plan elaboration process. Forming current and perspective plans requires detailed analysis of production-household activity in some plan time, finding unused internal production reserves, and taking into account technical progress factors impacting the plan period.

Planning is closely connected with economic analysis of expected and fact-solving plan tasks, including defining work results in the considered plan time, finding several factors' impact on production processes, and getting information for objective achieved results assessment. In this regard, quality planning is the basis for economic analysis.

In the middle position in management systems, between planning and accounts on one side, and regulation compliance on the other side, analysis always impacts management decision-making and is its logic base. Analysis quality and complexity highly impact the optimality of decisions made at several production management levels.

The role of economic analysis in management, including an awareness of the links with other functions, determines its importance in all production elements' practical activities. Analysis is not just an element of planning and prognosing the scientific base, but also serves as an instrument for objective activity assessment and is perhaps the most important means of household mechanism realization, production effectiveness, and improvement of reserves mobilization.

The modern practice of researching complex economic systems, as in industrial firms, requires creating a complex economic analysis (CEA) system, taking into account the complexity of the analysed objects and solved tasks. Because this practice requires elaborating on such economic analysis methods, which allow determining and appreciating several production process elements' complex interconnections and interdeterminance, finding their development among existing rules is critical (Figure 1).

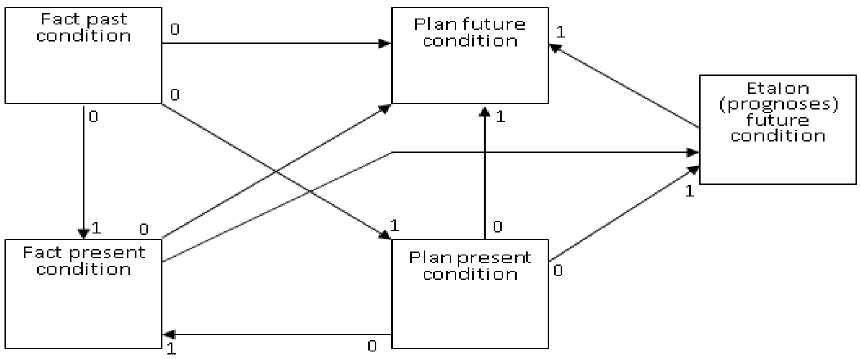

Figure 1. Several production process condition comparison types in CEA: 0 – comparison base; 1 – comparison (analysis) object

The advantage of the CEA system methodology is that it provides sufficiently wide analysis functions and strengthens its management aspect. Several kinds of analysis, forming CEA systems, allow researching all sides of enterprises (unions) and their units of activity integrated in each calendar time, which substantially increases management systems' effectiveness.

The authors of works on CEA solve its structuration question differently, describing several CEA kinds. On usage aims and spheres, in the CEA system there are the following analysis kinds: perspective, retrospective, operative, comparing, and functionally-cost. All mentioned analysis kinds differ on compared production process condition types (Figure 1). Each CEA kind considers one or some production process condition pairs when either comparison base, or object is only one type (Table 1) (Sheremet et al., 2004).

Thus, in the plan elaboration CEA process, the analysis object always plans the future production process condition, and comparison bases are fact present, plan, and etalon (prognoses) process conditions. In perspective analysis, comparison objects are prognoses or etalons—best analogic productions in the country and abroad—and the comparison base can be fact or plan present condition. Retrospective analysis compares several plan and fact present conditions with base past and fact conditions. Operative analysis compares only two production process condition types: analysis object is fact present condition, and comparison base is plan present production process condition. Inside each kind, CEA tasks are classified on production process compared condition types. Perspective and retrospective analyses are also divided on analysed time (future or past) deepness, and plan elaborations analysis and operative analysis of their solving.

CEA tasks are divided on the kind of figures analysed (money or natural volumes of resources and products) because it determines the specifics of the information search used and elaboration methods (Sokolitsyn, 2001), and CEA results usage in several plans' preparation. Principal CEA kinds and task classifications of the mentioned features are shown in Table 1. CEA methods are classified on researched objects and process descriptions with regard to economic-mathematical model kinds. There are linear, nonlinear, continuous, integer, static, dynamic, determined, and stochastic models, and two basic classes of economic analysis methods: direct and reciprocal factors (Bakanov & Sheremet, 1998).

Table 1. Principal CEA kinds and tasks classification

<table>
<tr><th rowspan="2">Analysis kind</th><th colspan="5">Compared production process conditions</th><th colspan="3">Figures analysis tasks</th></tr>
<tr><th>Fact past</th><th>Fact present</th><th>Plan present</th><th>Plan future</th><th>Etalon</th><th colspan="2">Money</th><th>Natural</th></tr>
<tr><td rowspan="2">Elaborations and plans system analysis</td><td rowspan="2">-</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">0</td><td colspan="2">Financial plan, enterprise and its units figures analysis</td><td>Resources, its usage, productivity analysis</td></tr>
<tr><td colspan="3">Analysis of technically-economic plansof functioning
Production improvement and development plan analysis
Functionally cost analysis</td></tr>
<tr><td rowspan="2">Perspective</td><td rowspan="2">-</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">-</td><td rowspan="2">1</td><td rowspan="5">Enterprise units activity comparison analysis (assessment)</td><td colspan="2">Long-term aim programs analysis</td></tr>
<tr><td>Production volumes and effectiveness growth prognoses and aims analysis on perspective</td><td>Science-technicalprognoses and aims of diminishing average resources of product analysis on single production stage</td></tr>
<tr><td rowspan="2">Retrospective</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">1</td><td colspan="2">Analysing dynamics and tendencies of changing figures
Statistical figures trust analysis</td></tr>
<tr><td>Analysing changing production volumes and effectiveness</td><td>Analysing changing average resources of product, resource usage on production stages</td></tr>
<tr><td>Operative</td><td>-</td><td>1</td><td>0</td><td>-</td><td>-</td><td>Deviations from operative plans analysis on enterprise units activity assessment figures</td><td>Deviations from operative production plans analysis on product, material stocks, material purchases, loading equipment and work force</td></tr>
</table>

Technology allows for the receipt of a product from a determined resources combination, which is data on resource costs for a production product unit. Then, the enterprise production process can be shown as a dozen interconnected technologies. Enterprise productions process resource products and create elaborate models for the resource products dozen.

When considering the technology dozen, there are multiple hypotheses, eventually leading to linear production models. The first hypothesis is that this dozen is finite. The second is that each average resource on the product unit for each technology is independent of the technology usage intensity (technology homogeneity). A third hypothesis is that the average resource on some technologies doesn't change with their uniting into one complex technology in one production unit (technologies additivity).

In the real economy, the majority of dependencies are more complex and non-linear; therefore, the linearity hypothesis simplifies reality. However, the suggested simplification is necessary because of two conditions. First, the production process characteristic links linearity, allowing for the simplification of the production process' mathematical description and usually adequately expresses this real process character. Secondly, deviations from linearity are compatible with the inevitable noise of modelling – casual changes in production process, account, and calculation errors.

All three mentioned hypotheses mean that each of the production process parts can be shown as an initial technologies linear combination, where the linear form coefficients are average resource products, and its variables are technology usage intensities.

2. Literature review

Many scientific works consider economic analysis to be the most important part of system industrial enterprise development management. Only a system approach allows for elaborating CEA methodology (Bakanov & Sheremet, 1998; Gluhov et al., 1998; Gradov et al., 2008; Kobzev & Kolesnichenko-Yanusheva, 2002; Sokolitsyn et al., 2013; Sokolitsyn, 2008; Sokolitsyn, 2001; Sokolitsyn et al., 2009; Sokolitsyn, 2012(a); Sokolitsyn, 2012(b); Sokolitsyn & Ivanov, 2012). Question is raised in A. D. Sheremet's works, having elaborated on the need for CEA theory elaboration based on inquiring about economic analysis as a production management method (Sheremet et al., 2004).

Economic analysis increases the role of statistical modelling of industrial enterprise production process parameters and provides a mechanism for entering all enterprise management levels (Gluhov et al., 2007; Demidenko & Malevskaya-Malevich, 2016; Mednikov, 2012; Nikolova et al., 2017; Nikolova et al., 2014; Semenov et al., 2016; Silkina, 2017; Rodionov et al., 2019; Demidenko, 2019; Sokolitsyna, 2019; Silkina & Danilov, 2020).

In modern organizationally economic conditions, much attention is paid to real production process data transformation for process-mining analysis. Dišek et al. (2017) considered real data transformation formatted from several information systems, achieving production process-mining analysis in a big automobile company. The research detailed the analysis production process, identifying "bottlenecks". Khalili and Chua (2014) suggested resource optimization for planned production by forming integrated pre-configured and grouped components. To predict complex configurations related to production resources and cost optimization, the study of Khalili and Chua adopts two new ideas, pre-configuring and component grouping, which are integrated into the mixed integer linear programming (MILP) model. These concepts form the basis for optimization of the MILP model development, leading to appropriate model adaptation and optimal production plan creation.

Ben-Gal and Singer (2004) present a new statistical process control methodology based on context modelling of discrete processes. The method uses a series of context tree models to estimate the condition distribution of process results based on data from previous observations. The Kullback–Leiber divergence statistic is used to find sufficient changes in the tree models during the process, allowing for flexible production system simulation.

Issues with analysing functioning, predicting several technologies, and mathematical programming for object development get enough attention in several aspects of their production-household activity (Yabuta et al., 2017; Brezhnev & Chernetskiy, 2016), which allows for an increase in their competitiveness and effectiveness.

Therefore, mathematical programming methods are widely used for describing and analysing production and technologic processes of household subjects related to several industries and property forms because these programming methods have enough universal character.

3. Materials and methods

The enterprise resource product transformation production process is modelled using the mentioned technologies dozen per defined time – usually a year. As with other such models, stocks of all identified resource products are defined based on a considered timeline, and resource product circulation (consumption) per this time. Any technological process usage intensity is measured as the product volume per considered time.

The technologies dozen is also used to model the enterprise production process part, in which the same resource products are manufactured on several technologies, or resource products can be changed by entering new technologies and organizational measures, changing the average resources of the products. The results of elaboration and organizational measures, named in general organizationally technical measures on economizing resources, are shown as changed or added technologies as new receipts of obtaining resource products.

The analysis of enterprise production programme variants requires an entire enterprise production process model. As with previous tasks, the desired outcome is maximal production process differentiation, allowing for increased precision in finding bottlenecks.

The descriptive statistics for the initial characteristics of the production process are used to form a complex information model of current conditions, developing and functioning the enterprise. This model helps to determine and compactly write figures, methods, and algorithms to solve complex economic analysis tasks related to enterprise work.

Uniting the enterprise's controlled and planned characteristics, figure descriptions, and measurements requires that an enterprise information model utilizes a mathematically-statistical description that can be used in its work planning. Therefore, an enterprise's mathematically statistical description must be determined by the essence of its planning tasks.

The basic tasks of planning, using economic analyses with mathematically statistical methods, form the classic balance input-output model.

4. Results

We must first establish initial production process characteristic marks. Their definitions are based on a "resource product" term – each material or labour resource or product of any production process unit.

We define $I = \{ i \mid i = \overline{1,n}\}$ as the enterprise resource products dozen for enterprise work economic analysis; depending on the particular economic analysis task, this dozen can include only input and output resources and products for single workplaces, primary units, works, or whole enterprises. I_{op} represents equipment type sizes, professions, and worker levels sub-dozen; T is the basic technological equipment work-time regime fund in the analysed period (below named *period T*); $V = \{v_1, v_2, \ldots, v_n\}$ is enterprise resource product circulation vector-column in period T; and $Y = \{y_1, y_2, \ldots, y_n\}$ is the resource product inputs from the environment and production stocks vector-column in period T for equipment and workers (their unit's or group's effective time funds, depending on classification). The vector $W = \{w_1, w_2, \ldots, w_n\}$ is the enterprise resource products and production stocks manufacturing vector-column in period T for equipment and workers (their underload); $d_{i\ell}$ is the i product direct cost coefficient per l resource product unit in the production process for equipment and workers (the exploitation hours number); and $D = \{d_{i\ell|i}, \ell \in I\}$ is the enterprise resource products direct costs coefficients square matrix.

The coefficient $d_{i\ell}$ describes the cost relationship in production technological processes with set resource product elaboration and assembly initial and middle conditions description differentiation levels. The model used the following typical hypotheses for defining the economically mathematical modelling of production technological processes:

1) The modelled technological processes dozen is finite.
2) Average resources (direct cost coefficients) per product unit for each product are independent of process usage intensity.
3) The average resources of some processes don't change once united into one complex technological process in one production unit.

In the case of resource product identification on some classification levels, each particular resource product in the enterprise classification group has its own particular number. Such a method allows the formation of a production process model at the same time for several equipment, labour resources, and materials classification levels.

In this model, equipment and labour resources are obtained from the environment, i.e. required no resources excluding financial resources. This, therefore, implies that

Figures v_i, $i \in I$ of vector-column V are determined in the following way:

$$v_i = \sum\nolimits_{\ell \in I} d_{i\ell}\left(v_\ell - y_\ell\right) + w_i, i = I,$$

If

$$v_\ell \geq y_\ell, \ell \in I, v_i \geq w_i, i \in I. \tag{1}$$

In matrix form, equation (1) is written as follows:

$$\mathrm{V} = \mathrm{D}\left(\mathrm{V} - \mathrm{Y}\right) + \mathrm{W}, \quad \mathrm{V} - \mathrm{W} = \mathrm{D}\left(\mathrm{V} - \mathrm{Y}\right), \tag{2}$$

when are *V, V - Y, V - W*, correspondingly, resource product circulation, production, and consumption vector columns.

We can solve equation (2) relative to V to obtain the following equation:

$$\mathrm{V} = \left(\mathrm{E} - \mathrm{D}\right) - 1\left(\mathrm{W} - \mathrm{DY}\right) \tag{3}$$

(E is a single square matrix with scale n x n).

The reciprocal matrix $(E - D)^{-1}$ is determined by dividing (4), if described by matrix D for which the production process has no turns, i.e. no middle process product is a resource for itself:

$$\left(E - D\right) - 1 = E + D^1 + D^2 + \ldots + D^k + \ldots, \tag{4}$$

if corresponding $k \leq n$ then $D^k = 0$.

Let's consider this matrix through F:

$$F = \left(E - D\right)^{-1} = \left\{f_{ij} \mid j \in I\right\}$$

where f_{ij} for $i \neq j$ is the i resource product total costs coefficient per j resource-product unit.

$$FD = F - E = DF \tag{5}$$

According to (3) and (5),

$$V = FW = \left(F - E\right)Y \tag{6}$$

or

$$V - Y = F\left(W - Y\right).$$

Marking matrix (5) as F*, we obtain

$$\mathrm{V} - \mathrm{W} = \mathrm{F}^*\left(\mathrm{W} - \mathrm{Y}\right). \tag{7}$$

Matrix equations (5)–(7) are the basis of forming the FIG enterprise balance.

We can define $I_0 \subset I$ as the resources sub-dozen obtained only from the environment. We can also set $I_{op} \subset I$. It must confirm that $v_i = y_i$, $i \in I_0$. Then, from (6), we obtain the FIG enterprises balance equation:

$$F_{(i)}\left(W - Y\right) = 0, i \in I_0, \tag{8}$$

where $F_{(i)}$ is the *i* row of the F matrix.

All other resource products must confirm that:

$$v_i - y_i \geq 0,$$

i.e.

$$F_{(\mathrm{i})}\left(\mathrm{W} - \mathrm{Y}\right)0,\ \mathrm{iI} \setminus I_0. \tag{9}$$

In addition, there are limitations on resource product consumption from the environment:

$$Y \leq Y_0, \tag{10}$$

where Y_0 is the corresponding limitation vector-column in the plan period *T*;

and limitations on manufacturing products are given by:

$$W \geq W_0, \tag{11}$$

where W_0 is the minimal tasks vector-column on manufacturing products.

All non-negative W and Y values, confirming (8)–(11), form a firm enterprise possible plan in period *T*.

Fact (present) production process conditions correspond to one of system (8)–(11) possible answers:

$$\begin{cases} v_i = w_i + \sum_{j \in I \setminus I_0} f_{ij}^*(w_j - y_j), & \mathrm{i} \in I \setminus I_0; \\ y_i = v_i = w_i + \sum_{j \in I \setminus I_0} f_{ij}^*(w_j - y_j), & \mathrm{i} \in I \setminus I_{\mathrm{op}}; \\ w_i = y_i - \sum_{j \in I \setminus I_0} f_{ij}^*(w_j - y_j), & \mathrm{i} \in I_{\mathrm{op}}; \end{cases}$$

because $f_{ij}^{*} = 0$ for $i \in I, j \in I_0$ according to the initial resources dozen I_0 definition (including the equipment and workers sub-dozen I_{op}).

Let's consider $t_{i\ell}$ as the time of closing (manufacturing forwarding) *i* resource product units in the production process of making ℓ resource product units. For equipment and workers $t_{il} = 0, i \in I_{op}, \ell \in I$. For $i = \ell$, we can set $t_{i\ell}$ equal to the time of closing I resource product in its own circulating stock, if this stock isn't included in any production process of making another ℓ resource product (in this case, time of closing in this circulating stock is included in the time of closing in the production process). This gives the stock-level characteristic:

$$h_{i\ell} = \begin{cases} \dfrac{1}{T} d_{i\ell} t_{i\ell}, i \neq l, i \in I \setminus I_{op}, l \in I, \\ \dfrac{t_{i\ell}}{T}, i = l, \end{cases}$$

where $h_{i\ell}$ is the level of direct closing (stock) of *i* resource product in the production process of making ℓ resource product units, particularly circulating stock if *i* =. For equipment and workers, definitely, $h_i = 0$, if $i \in I_{op}, \ell \in I$ or $\in I, \ell \in I_{op}$.

We can consider $H = \{h_{ij} \mid i_{ij} \in I\}$ as the square matrix of levels of direct closing (stocks) resource products in the production process. Let's define g_{ks} as the level of direct closing *k* resource product in the production process of making *s* resource product as follows:

$$g_{ks} = \sum_{i \in I} \sum_{\ell \in I} f_{ki} h_{i\ell} f_{\ell s}, \ \ \mathrm{k} \in \mathrm{I}, \ \ \mathrm{s} \in I \setminus I_{\mathrm{op}}; \ \ \mathrm{g}_{\mathrm{ks}} = 0, \ \ \mathrm{s} \in I_{\mathrm{op}} \qquad (12)$$

We can define a set G of all possible g_{ks} characteristics if $k, s \in I$ form a matrix of levels of total closing resource products in the production process:

$$G = \{g_{ks} \mid k, s \in I\} = FHF.$$

The g_{ks} characteristics are used to calculate the time lag between manufacturing *k* and *s* resource products:

$$\tau_{ks} = \frac{g_{ks}}{f_{ks}} T, \quad \mathrm{k} \in \mathrm{I}, \ \ \mathrm{s} \in I \setminus I_{\mathrm{op}}$$

Therefore, there are financially industrial groups' enterprise production processes initial mathematically statistical characteristic and natural figures systems.

With coordinated operative accounts and accounting, a united balance model includes initial and final stocks, circulation of materials, and middle, non-finished, and mature products in a set operative period in natural and money volumes. The model allows us to obtain the needed data for both basic production operative management and material values accounting (forming circulating and saldo sheets).

These normative changes allow us to locate when corresponding fact production stocks exceed or underperform and eliminate their causes. Finding and analysing these and all other set figure deviations from the norm require special methods.

The described mathematical statistical approach usage allows for the modelling of enterprise processes for effective production development plan elaboration with methods of mathematical programming in the following ways:

- Defining production programme alternatives and identifying production development opportunities and threats;

- Defining constructor-technologic solution alternatives and buying resources for production development.

These approaches are realised with all-side economic analysis of enterprise development plans.

The task of effective planning can be formulated as follows:

$$ZW \rightarrow max;$$

$$F_{(i)}(W - Y) = 0,\ i \in I_0, \quad (18)$$

$$F_{(i)}(W - Y) \geq 0,\ i \in I/ I_0, \quad (19)$$

$$0 \leq Y \leq Y^0, \quad (20)$$

$$W \geq W^0. \quad (21)$$

The objective function includes money figures: $Z=\{z_i\ |i \in I\}$ is the price vector of resource products together with materials and middle product prices, when $z_i = \alpha_i$;and ZW is total revenue.

Effective planning is realised on these sums basis with methods of linear programming on the basis of the unknown vectors W and Y. Defining an effective plan to double estimations (20) allows the identification of resource deficits and damaging production development with diminishing product outputs. Defining production development opportunities and threats correlates with the task of defining an effective production programme, W. Thus, complex modelling of enterprise production activity is realised for economic analysis and effective planning.

With a coordinated operative account, a united balance model of statistical modelling for enterprise production process parameters includes initial and final stocks, flows of materials, and middle, unfinished, and mature products in a defined operative period in natural and money volumes. It allows us to obtain the needed data for both basic operative production management and material values accounts.

This elaborated economically mathematical model of defining enterprise production process parameters can be used for a wide range of market economy household subjects' management tasks in several branches and property forms.

The elaborated production process model realization provides the following complex solutions to economic analysis tasks:

- Initial production process parameters account
- Initial natural figures calculation
- Complex natural and money figure calculations.

Cost reduction on entering the elaborated model requires standardized software usage. Calculations consist of standard matrix calculations; the production process model is realised in one of the mechanic assembling production of an energetic machine-making enterprise, having leading positions in St. Petersburg and North-West Russia in this branch.

4. Discussion

Factors restricting such multidimensional economic analysis include used production methods and costs operative account system opportunities, and also needed production process plan conditions recalculation (or early calculation usage) opportunities for analysed time intervals. This requires marking three basic economic analysis conditions in the suggested methods:

- United centralized details for the production operative account system, controlled in the balance work objects enterprise model in elaboration and assembly.
- Entering the normative production costs in the account method, including systematic accounts,

summing, and showing each defined period for planning, all caused by norms variation, resource costs, and fact costs deviations.

- Organizationally-technic opportunities to calculate and correct operative plan tasks for production units with needed frequency.

This elaborated economically mathematical model for defining enterprise production process parameters is sufficiently universal. First, it can be used for each enterprise management unit in each production process part with each decomposition or aggregation level. Second, it can be used in several kinds of economic analysis tasks. Thus, this production process description is made for operative, retrospective, and perspective economic analysis with several methods, but in structure and content, it must be unified, fit to a united conceptual balance model with a statistic defining enterprise production process parameters.

5. Conclusion

Providing a complex, full-blown, and true enterprise production process description is a difficult problem with some methodological and organizational aspects. Economic analysis task solutions on a united complex enterprise production process description base take into account several enterprise production household activity factors that require appropriate mathematical and informational resources. If a factor economic analysis mathematical apparatus is elaborated enough and universal for all analysed factor models figures, then the factor model creations with statistical modelling enterprise production process parameters on existing enterprise statistical data is no longer an unelaborated task in both method and organisationally informational aspects. This task is most effectively solved in creating special complex economic analysis subsystems, whose core is a united model of defining complex balance enterprise production process statistic parameters. Usable analysis methodologies are needed for some economic analysis tasks, particularly factor figure models defined from these balance model enterprise production process statistic parameters.

Existing enterprise management systems are maximally prepared too wide, entering only retrospective economic analysis tasks using cumulated account-statistic production data.

Obviously, particular enterprise management systems can include several solutions to these questions. Therefore, elaborating on economic analysis models and software, oriented not on a particular enterprise management system but on the whole industrial enterprise, requires a clear united standard (typical) base that considers an elaborated complex enterprises balance, production process parameters statistics, a defined model base universal for some enterprises, and also tasks and methods of constructing optimal development for a particular enterprise.

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