Conceptual Image of Intellectual Optimization Technology for Anti-crisis Tax Management Innovations in Relation to High-Tech Enterprises

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Abstract

The problematic task of complex taxation is considered in relation to a high-tech industrial enterprise for two categories of macro situations: "ordinary" and crisis one. The criticality of the taxation factor is shown and the main disadvantages of the tax system for the discussed area are highlighted using the example of modern Russian realities. A typological variety of tax environments associated with a modern Russian high-tech enterprise is presented and they are integrated into a system. They are classified on the basis of taxpayer subjectivity in the context of the hierarchical level (macro-, meso- and microlevels) and country affiliation. Substantial formulation and formalization of the optimal taxation problem for the external macroenvironment for cases of non-crisis and crisis situations are presented. Software and mathematical tools for solving it are configured. There are demo example and references to testing the proposed development.

Keywords: crisis management, enterprise, optimization, taxation, tax systems engineering

1. Introduction

Any modern enterprise (legal entity) of the Russian Federation, as well as any other state, operates in the external macro- and mesoenvironment: necessarily in the regional and often in the internal corporate environment (Demchenko, Dmitriev & Minaev, 2011; Demchenko, 2011; Bodrunov, Dmitriev & Kovalkov, 2002). In addition, the enterprise is not a "black box", but the system within which a microenvironment for operating units and workers exists and can be developed by emulating additional spaces, including the so-called intra-company entrepreneurship system (Dmitriev & Dergunov, 2004; Kanashchenkov et al., 2005). At the same time, intra-corporate environments can be multilevel (for example, for hierarchical holdings), as well as intra-company environments, if intra-company entrepreneurship is expanded to the levels of intra-subdivision pseudo-markets. In all these environments, in any way, the tax system or its semantic analogue operates, which provides for the introduction and implementation of a certain deduction system with so-called tax payments of taxpayers to tax recipients. These payments are in the nature of an upward resource allocation for the implementation of the relevant management activities of management systems of a higher hierarchical level in the interests of taxpayers and entities under the resource patronage of them.

In modern Russian conditions, tax systems of any hierarchical level and subject attachment are not systems in the fundamental sense of the term. They are spaced out, organized and operate with violations of the conceptual and implementation principles of management.

Accordingly, there is an objective need for the scientific synthesis of the integrated tax system, which, firstly, must be scientifically substantiated, and, secondly, have a cross-cutting character: from the macrolevel to the microlevel through the mesolevel. In this case it will have the character of a hybrid of the classical tax system and the pseudo-tax system, or their complexes. In relation to the state level (here for the Russian Federation), federation subjects and municipalities, it will be the classical tax system, and in relation to corporations (corporate groupings), enterprises and their divisions, it will be a pseudo-tax one. It should apply both to Russian enterprises and partially to their foreign counterparties, but, of course, in an unlawful degree and form. In this sense, there is the idea of external management of corporate or pseudo-corporate groupings (Dmitriev & Novikov, 2017).

Another significant problem that has now been revealed in almost all countries of the world is the obligatory distinction between the external tax administration for cases of varying degrees of "normality" of the situation: everyday situations, situations of local crisis (for one enterprise or some group of them) (Zolotova, 2017; Dmitriev & Zolotova, 2020) and crisis situations of a global nature (macrocrisis). Approaching the resolution of a problematic tax situation should be connected with the solution of universal incorrectness of the tax system (Dmitriev & Novikov, 2018).

2. Area Description

High-tech enterprises are very sensitive to the characteristics of the taxation system under which they fall (Dmitriev et al., 2013; Mal'ko, 2008; Zuev, 2014).

This applies to all components of the tax system, but even in the simplest cases, the author's review of various management situations showed that critical conditions of enterprises begin to arise or disappear when tax rates vary at the level of tenths of a percent. In more complex cases, for example, when comparing the standard taxation system and the so-called simplified one for small enterprises through computer experiments, it was found that tax system transformations are an extremely significant factor in the external management of enterprises. An analysis of the experience of introducing the so-called intra-company entrepreneurship, including now widely spread in universities (although it is most often not formally declared) also gives rise to an unambiguous statement that a change in the system of income withholding under contracts at levels, for example, "department-faculty-university" fundamentally changes the motivation of executing employees in terms of initiating contracts and their execution.

Unfortunately, all the components of tax and pseudo-tax systems that have operated and are operating in Russia cannot be considered satisfactory. As it is known, not all tax systems of other states are also assessed as ideal.

The existing Russian tax system and, accordingly, the current Russian tax legislation have a number of significant disadvantages, which include the following (Dmitriev & Novikov, 2018; Dmitriev, 2018b):

- disadvantages of the national regulatory framework of a general nature (Dmitriev, 2018a);
- excessive fiscality of the tax system, reaching the level of confiscation;
- significant predominance of fiscality over regulatory;
- ignoring the heterogeneity of the economic space and its actors;
- poor regulatory, reaching confusion, declarative vagueness of a number of legal provisions;
- instability and uncertainty of tax innovations, lack of appropriate state guarantees for compensation for damages caused by these dynamics and non-determinism;
- presence of direct or indirect retrospective effects, including the introduction of laws actually retroactive, increasing the tax burden of taxpayers;
- lack of a mechanism for the restructuring of tax arrears and the institution of tax amnesty and active tax repentance;
- presence of a number of conceptual errors, including the fallacy or lack of definition of the identified typical components of the tax system;
- lack of harmonization with tax systems of leading states;
- cumbersomeness associated with a high multiplicity of taxes, their options and so-called splitting, when for one taxpayer and one object of taxation there is more than one primary tax receiver;
- extremely complicated representation of the tax system;
- absence of noticeable rental taxes on consumed objects that are in the nature of the public domain such as subsoil;
- internal uncertainty, which should often be resolved either by the apparatus of federal and regional authorities, or by tax authorities, including local tax authorities such as the state Tax Inspectorate and specific tax inspectors;
- presence of multiple taxation, when the same object acts as an object of taxation for different taxes, although Russian legislation unequivocally establishes that one and the same object can be taxed with the same type only once for a statutory tax period. In practice, up to nine consecutive repeated taxation (direct or indirect);

- existence of real and powerful competition among taxpayers. Due to the fact that the company makes tax payments, it is entitled to establish the sequence and size of these payments within the limits stipulated by tax legislation. Moreover, an enterprise may pay one tax, do not pay another, and pay a third part, but not for all taxpayers;

- preservation of single-channel transfer schemes providing for the subsequent redistribution of tax revenues received by primary tax recipients in favor of secondary ones. In these conditions, the tax recipient receives undoubted advantages over other recipients of tax revenues (secondary tax recipients). Such a scheme has serious negative potential when targeting any primary tax recipient, as provides him with levers of manipulation by secondary taxpayers on the part of taxpayers and primary taxpayers;

- advance nature of certain tax payments, which worsens the financial and economic results and the financial and economic condition of the enterprise, increasing its need for working capital;

- initiation of costly mechanisms in the field of entrepreneurship and discouraging profitable industrial and economic activities;

- presence of a developed institution of an open set of by-laws such as tax instructions and clarifications;

- creation of prerequisites for an erroneous interpretation of legislative regulations due to the incompetence of tax employees;

- prohibition of the institution of fiscal substitution of the taxpayer, in the framework of which one person assumes obligations to fulfill the tax obligations of another person (similarly for groups of persons);

- exclusion of the institution of tax amnesty and the statute of limitations;

- presence of tax authorities practically unlimited and uncontrolled monitoring and repressive capabilities.

The ongoing tax reforms eliminated or mitigated some of these disadvantages. However, such tax innovations are local, not very evolutionary and do not solve the tax problem of Russia in general.

In relation to modern conditions, the tax system of Russia and many other countries (of course, we do not talk about countries with critically lowered levels of economic development, there tax problems, or the problems of taxes and levies are completely different) turned out to be practically unsuitable. In fact, the actual biological crisis inevitably everywhere entails (in parallel and also as a consequence) if not an economic catastrophe, then at least an extremely deep economic crisis that completely affects the economic complexes of countries. Along with this, for a number of countries, a serious blow was the drop in demand for hydrocarbon energy carriers and, as a result, its actual depreciation followed by overstocking. Not the last negative contribution is brought by the imposition of economic sanctions against a number of countries, which are producers of energy resources. Thus, for many resource-producing countries, a two-factor or three-factor synergetic overlay of crises has arisen. That is, in the economic aspect, one-factor, two-factor and three-factor crises can be distinguished. Of course, their tax systems could not withstand such a shock load (Dmitriev, 2017).

Convulsive attempts by state authorities to adapt tax systems on an empirical basis are doomed to failure. Semi-populist attempts to reduce fiscality, bring benefits and preferences, various kinds of postponements, etc., in fact, represent the collapse of tax systems and generate negative recurrences in the form of harmful positive relationships. So, for example, a reduction in tax rates entails a decrease in the occupancy rate of the revenue side of the budget and then a decrease in the potential for budget support of taxpayers. The tax system should be optimized for two conjugate phases in the complex: crisis and post-crisis one. The idea of introducing unjustified emergency tax breaks is counterproductive, because attempts to use empiricism instead of justifications can generally create aggravating problems (including the well-known scheme "using a medicine is more dangerous than the illness").

3. Material Studied Applicability of Forerunners' Development

The issues of taxation at all times in all countries have been given very substantial attention.

The corresponding description of historical retrospective can be associated, among other things, with Alexander P. Pochinok (this information is extremely poorly presented in his printed works), the former Minister for Taxes and Duties and later Minister of Labor and Social Development in the Russian Federation. The dominant part of Russian publications on this subject is educational materials for students and teaching materials for the accountants. However, there are also quite fundamental materials (Malkina & Balakin, 2019).

There were many publications about taxation abroad (Smith, 1995; Kay & King, 1980; Debatin, 1969).

However, almost all of these publications were characterized by the following:

- focus on analytical discussion of retrospective and qualitative assessment of the tax system;
- refusal to use the developed apparatus for operations research;
- lack of examples of strict optimization of the tax system at least at the level of conceptual approaches;
- lack of coherence of research with the problems of crisis management.

Accordingly, there were no prototypes in the form of intelligent (information-advising) DSS environments supporting full-featured tax management. It is obviously, that this is largely due to any tax transformations are connected with passing through the legislative bodies. Meanwhile, the bulk of their workers are clearly not advanced subjects in the field of intelligent methods of operations research.

4. Methodologies and Methods of Research

Structuring of the methodology is presented in a number of publications (Rodionov, 2004; Rodionov, 2006; Dmitriev et al., 2013; Zolotova, 2017).

Therefore, for the declared thematic conceptual constructions it was considered expedient to use a multidisciplinary theoretical complex, including the following theories and scientific directions:

- system analysis;
- general control (management) theory;
- theory of state and regional governance;
- jurisprudence;
- organization theory;
- optimization theory;
- theory of sets;
- information theory, etc.

5. Results and Discussion

5.1 Proposed Presentation of the Tax System

It is advisable to present the tax system in the form of a regulatory operator as defined for the general case (Dmitriev, 2018b), described by a rule according to an "if-otherwise" scheme with allocation of tax entities, objects and tax relations among operands.

Accordingly, in order to formulate proposals for reforming the Russian tax system, it was proposed to move away from this vicious stereotype and, along with correcting obvious shortcomings such as the lack of definitions, introduce a conceptual scheme for the feasibility study of reform tax management decisions (Dmitriev, 2005).

We single out the following typology of tax environments:

- federal tax environment;
- tax environment of the subject of the federation;
- tax environment of the municipality.

These environments can be multiplied by taking into account those states that are subjects of international law in which Russian high-tech enterprises operate, as well as their foreign counterparties.

Next, we highlight the following typology of pseudo-tax environments in case of their formal or actual presence:

- corporate pseudo-tax environments of all levels (depending on the hierarchy of the corporate grouping);
- intra-company pseudo-tax environment;
- intra-department pseudo-tax environments.

We consider a system design engineering task as a representative project in relation to federal taxation introduced by the Tax Code of the Russian Federation.

As a project prototype, development was used that was related to solving the problem of optimal tax deployment of an enterprise (Rodionov, 2004; Rodionov, 2006).

The corresponding conceptual approach provided for a meaningful statement, formalization and solution of a managerial task or a complex of such tasks.

5.2 Substantive Statement of the Task

Substantive statement of the task of reforming the tax system was as follows:

The choice of the managed object and the section of its substantive examination. The managed object is a lot of taxpayers who are subject to the tax legislation of the Russian Federation. For certainty, we will choose the most typical case, when taxpayers are legal entities (enterprises). Taking into account the shift of the economy towards a post-industrial economy, we will assume that high-tech enterprises are being considered. In particular, they are surrounded by a standard tax system and do not enjoy tax preferences.

The considered managed object has many aspects, including production and technology, social, information, infrastructure, counterparty, security, environmental, etc. However, among them all, only one subject section is chosen: financial and economic, in the context of which a meaningful statement of the managerial task is made.

The choice of the composition of the operating parties. Operating parties will be considered subjects whose state significantly depends on the state of the selected managed object.

Among the operating parties there are:

- state governing bodies;
- regional governing bodies;
- legal entities (enterprises) - taxpayers;
- directorates of legal entities;
- labor collectives of legal entities;
- participants of legal entities.

The choice of the subject of management. The subject of management is the state management body is a Complex of Legislative Bodies (CLB) of the Russian Federation.

The formation of the goals of the operating parties. We consider which main goals are pursued by the operating parties identified above.

One of the features is associated with the lack of strict predetermination and the announcement of the goals of all interested parties. For many of them, it is necessary to produce subjective authorization of goals in view of the absence of officially proclaimed.

As it was determined above, we concretize the goals in the financial and economic aspect with some ideal idea of the goals of the operating parties.

State Governing Bodies (SGB), including CLB, are interested in maximizing the income of the consolidated budget and in maintaining the enterprises allocated in the managed object. They are essential as a sphere of employment and are necessary to ensure the state needs of production. The preservation of financial solvency (exclusion of bankruptcy) of these enterprises, in addition to preserving the sources of tax revenues, prevents the employment costs of their personnel and producers and manufacture potential, including export-oriented ones, which improves the balance of Russia's foreign trade.

It should be emphasized that these bodies do not pursue the goal of maximizing the profits of enterprises that are part of the managed object as independent. However, they cannot ignore the commercial nature of these enterprises; at least they have no right.

Therefore, these bodies should also pursue a group of goals related to maximizing the total net profit of each of the enterprises allocated in the managed object.

The apparatus of SGB is also interested in maximizing their own incomes and maintaining their social and official status or increasing it, which is unambiguously linked to the proper quality of functioning and performance of these bodies.

Regional governing bodies (RGB) are interested in maximally replenishing the revenue side of their budgets through tax deductions from relevant enterprises and minimizing the costs of employing enterprises.

The objectives of the RGB are legitimately identified with its objectives.

Enterprises have statutory goals, among which their main financial and economic goal is to maximize total net profit. Due to the fact that they are established for normal functioning and development, one of its indispensable goals

should be the elimination of their own bankruptcy or liquidation on the grounds of non-compliance with current legislation.

The directorates of enterprises with the proper organization of incentives must identify their goals of the enterprises, which they manage.

The labor collectives of enterprises with the proper organization of incentives must identify their goals of the enterprises, there they work. They are interested in maximizing payroll.

Participants in enterprises are interested in maximizing the income from participation and the level of quotes for these participation rights and in preserving the respective enterprises as a condition for this.

Of course, it is easy to identify a lot of operating parties: for example, applicants for the purchase and buyers of emerging rights to participate in the enterprise, but their goals can be considered low priority and do not take them into account.

The choice of management goals. The objectives of CLB as a subject of management remain unchanged in relation to those that have already been formulated above for the relevant operating party:

- maximization of the total budget revenue, including taxes and income from participation in enterprises;

- ensuring the best financial and economic performance of enterprises, including their profitability;

- exclusion of bankruptcy or liquidation of enterprises on other grounds, including as a result of a violation of applicable Russian law;

- ensuring the best financial and economic conditions for the employment of workers (dilemma "number of employees - level of their wages" is allowed at the discretion of managers) and maximizing the size of the wage fund.

Obviously, these goals are generally conflicting.

The choice of the composition of managerial influences. This management impacts are presented in one of the following two versions:

- tax system processor;

- transformation processor of the tax system.

Determination of the composition of external influences on the managed object with the exception of managerial influences. The managed object is affected by a number of objects and subjects of the external environment, and through several channels.

The most significant environmental impacts include the following:

- market conditions;

- macroeconomic situation;

- geoclimatic situation;

- geopolitical situation, etc.

The identification of invalid state of the managed object. The state of the considered managed object is recognized as unacceptable if at least one of the stated management objectives is not achieved:

- provided level of budget revenues related to the functioning and development of the managed object is not ensured;

- acceptable level of the total net profit of at least one of the enterprises has not been reached;

- bankruptcy of at least one of the enterprises took place, which is impractical;

- size of the wage fund of employees of at least one of the enterprises whose bankruptcy is unacceptable is less than the specified level.

The identification of unacceptable managerial influences on the managed object.

The following categories of tax system transformations are classified as unacceptable managerial influences:

- violating applicable Russian law;

- contrary to common sense (for example, negative tax rate).

Thus, in terms of content, the managerial task of optimal taxation (introducing or transforming the tax system) provides for finding a temporary sequence (tuple) of such changes in this tax system that, under the expected external conditions, would maximize the achievement of the identified goals, provided that the prohibitions were followed as financially and economic potential of the country and individual enterprises, as well as managerial influences.

5.3 Formalization of This Management Task

Formalization of this management task will have the following form.

The object and subject localization of the managed object.

The managed object of management is a complex of high-tech industrial enterprises of a certain state considered in the financial and economic aspect.

Suggestions and assumptions are presented in context.

The formation of state indxes set (variety). In accordance with the introduced management objectives, we form a set of state indexes of the managed object.

The analysis showed that when forming state indexes of the managed object occurs the following:

- high degree of representativeness of state indexes is achieved;
- it is possible to greatly approximate the dimensionality of the space of state indexes to the dimensionality of the target space;
- it is possible to form exclusively numerical state indexes;
- in some cases, goals are assigned integrally for all manufacturing enterprises that are members of the corporate structure, and in some cases for each of them individually.

There is some subjective dimension of legal entities - taxpayers of the Russian Federation. Let their total number be M. In general, it can be all high-tech enterprises in the country. But we can consider the abstract case $M = 1$, when a certain known typified enterprise is exposed to research. It is clear that such degenerate scaling will give rise to errors of unknown magnitude. However, to identify qualitative patterns and identify the point of initial approximation, such a study seems to be productive.

We will formalize the management task for the period $(t^{beg.}, t^{fin.}]$, where $t^{beg.}$ is the initial (for example, current) point in time, $t^{fin.}$ is the final point in time for a certain management period (it is also the optimization period). We will consider time as discretized and assign its moments numbering as natural numbers, and we will set the length of the discrete interval as a constant D.

We will use some of the considerations for introduction of state indexes from (Zolotova, 2017; Dmitriev & Novikov, 2018).

Management objectives, providing for the maximization of the total net profit of enterprises, put in line with the state index $I^{1,m}(t)$, presenting it as follows:

$$I^{1,m}(t) = \sum_{\tau = t^{beg.}+1}^{t} P_m(\tau) ; m \in [1, M],$$

where $P_m(\tau)$ is net profit of m-th enterprise in the period $(t^{beg.} + \tau - 1, t^{beg.} + \tau]$.

We will put in line two state indicators for each m-th enterprise of M management objectives that provide for maximizing the chances of eliminating the liquidation of a specified set of enterprises for financial and economic reasons arising from current legislation.

The first of these state indexes $I^{2,m}(t)$ we correlate with the amount of cash balance of m-th enterprises at a point in time t, defined as the value of its current assets with the exception of the amount of receivables. This state index will characterize the level of financial solvency of this enterprise.

The second of these state indexes $I^{3,m}(t)$ we associate with the legislative requirement that the value of the net assets of the enterprise exceed the value of its initial capital, expressing it as follows:

$$I^{3,m}(t) = C^{NA}_m(t) - V^{IC}_m(t),$$

where $C^{NA}_m(t)$ is the value of the net assets of the m-th enterprise at the time t;

$V^{IC}_m(t)$ is the amount of initial capital of the m-th enterprise at a point in time t.

Goals management, providing for maximizing the value of total income from federal participation in enterprises, we put in line with one state index $I^{4,0}(t)$, presenting it as follows:

$$I^{4,0}(t) = \sum_{m=1}^{M} \sum_{\tau = t^{beg.}+1}^{t} \lambda_m(\tau) * \delta(\tau) * P_m(\tau),$$

where $\lambda_m(\tau)$ is the share of federal participation in the m-th enterprise at a point in time τ;

$\delta(\tau)$ is the share of net profit of the m-th enterprise allocated to pay the income of the participants of this enterprise from participation in it at a time τ.

Management objectives, providing for the maximization of the total tax deductions of enterprises in the consolidated budget, we put in line one state index $I^{5,0}(t)$, presenting it as follows:

$$I^{5,0}(t) = \sum_{m=1}^{M} \sum_{\tau = t^{beg.}+1}^{t} T_m(\tau),$$

where $T_m(\tau)$ are the total tax deductions of the m-th enterprise for the period $(t^{beg.} + \tau - 1, t^{beg.} + \tau]$. To simplify it, let this be the amount of tax deductions to the consolidated budget. Nothing prevents elementary splitting of this state index by type of budget, because the targeting of tax deductions can also be optimized.

And finally, we reflect the immediate social goals. We introduce a status indicator $I^{6,m}(t)$ and correlate it with the size of the wage fund of workers of m-th enterprise at a point in time t.

If necessary, the entered state indexes of the managed object can be easily modified to take into account the inequality of financial and economic results at various points in time, for example, discounted by time factor. In this case, in the above linear forms, another kind of majorizing coefficients will appear.

The result is the following system of state indexes (vector state index):

$$\{I^{1,m}(t);\ I^{2,m}(t);\ I^{3,m}(t);\ I^{4,0}(t);\ I^{5,0}(t);\ I^{6,m}(t);\ m \in [1, M]\};\ t \in [t^{beg.}+1, t^{fin.}],$$

having this dimension: $2 + 4*M$.

The formation of criteria space.

We identify many criteria for optimizing tax transformations with many state indexes of many high-tech enterprises.

The formation of managerial decisions variety (set). Due to the fact that the introduction and transformation of taxes corresponds to the relevant managerial decisions, we will present these mechanisms in the form of some operators in the general appearance:

$$T^{Tax}(t);\ t \in (t^{beg.}, t^{fin.}-1].$$

This choice is fully consistent with the appropriate presentation of the management tax strategy in the form of a rule.

The formalization of many external influences. We will also present them in general form, in the form of operators:

- legislation operator $J(t)$;
- market situation operator $C(t)$.

Formation of a system of restrictions.

We assign:

- extremely low value of the weighted total net profit of enterprises at the level of $I^{add.\ 1,m}(t^{fin.})$; $m \in [1, M]$;
- distribution of enterprises according to the feasibility of their liquidation in the form of a boolean vector G_m; $m \in [1, M]$, where equality to unity means liquidation is permissible of the m-th enterprises, and equality to zero is the inadmissibility of this;
- extremely low cash balance for each point in time $t \in [t^{beg.}+1, t^{fin.}]$ and each enterprise of $m \in [1, M]$; which we take equal to zero (according to the Russian bankruptcy law there is a small amount and a three-month delay). Therefore, we will tighten this restriction to obtain some guarantee of the final effectiveness of external tax managing decisions;
- extremely low level of excess of the value of net assets over the value of the initial capital, which is assumed to be zero for each point in time $t \in [t^{beg.}+1, t^{fin.}]$;

- excessively low amount of income from federal participation in manufacturing enterprises-members of the corporate structure, which we will limit from below with the level $I^{add. \, 4,0}(t^{fin.})$;

- excessively low value of the total tax deductions of enterprises to the consolidated budget, which will be limited below with the level $I^{add. \, 5,0}(t^{fin.})$;

- extremely low level of the wage fund of employees of enterprises $I^{add. \, 6,m}(t)$ for every moment in time $t \in [t^{beg.}+1, \, t^{fin.}]$ and each enterprise of $m \in [1, M]$.

We assume that managering decisions do not violate the prohibitions specified in the substantive statement of the problem $T^{add.}(t)$, i.e.:

$$T^{Tax}(t) \in T^{add.}(t); \, t \in (t^{beg.}, \, t^{fin.}\text{-}1].$$

Then the system of restrictions will take the following form:

$$
\begin{cases}
I^{1,m}(t^{fin.}) \geq I^{add. \, 1,m}(t^{fin.}); \, m \in [1, M]; \\[2ex]
\sum_{m=1}^{M} (1 - G_m) * [1 - sign\{I^{2,m}(t)\}] * sign\{I^{2,m}(t)\} = 0; \, t \in [t^{beg.}+1, \, t^{fin.}]; \\[2ex]
\sum_{m=1}^{M} (1 - G_m) * [1 - sign\{I^{3,m}(t)\}] * sign\{I^{3,m}(t)\} = 0; \, t \in [t^{beg.}+1, \, t^{fin.}]; \\[2ex]
I^{4,0}(t^{fin.}) \geq I^{add. \, 4,0}(t^{fin.}); \\[1ex]
I^{5,0}(t^{fin.}) \geq I^{add. \, 5,0}(t^{fin.}); \\[1ex]
(1 - G_m) * [1 - sign\{I^{6,m}(t)\}] * sign\{I^{6,m}(t)\} = 0; \, t \in [t^{beg.}+1, \, t^{fin.}]; \, m \in [1, M]; \\[1ex]
T^{Tax}(t) \in T^{add.}(t); \, t \in (t^{beg.}, \, t^{fin.}\text{-}1].
\end{cases}
$$

where *sign* is the signature function.

The formation of many optimality criteria. We identify the optimality criteria (performance criteria) with the state indexes of the managed object introduced above.

Then the desired formalization of the managerial task will have the following form:

$$
\begin{cases}
I^{1,m}[J(t), C(t), t^{fin.}] & \rightarrow \quad max; \, m \in [1, M]\}; \\
I^{2,m}[J(t), C(t), t] & \rightarrow \quad max; \, m \in [1, M]\}; \, t \in (t^{beg.}+1, \, t^{fin.}]; \\
I^{3,m}[J(t), C(t), t] & \rightarrow \quad max; \, m \in [1, M]\}; \, t \in (t^{beg.}+1, \, t^{fin.}]; \\
I^{4,0}[J(t), C(t), t^{fin.}] & \rightarrow \quad max; \\
I^{5,0}[J(t), C(t), t^{fin.}] & \rightarrow \quad max; \\
I^{6,m}[J(t), C(t), t] & \rightarrow \quad max; \, m \in [1, M]\}; \, t \in (t^{beg.}+1, \, t^{fin.}], \\
\quad T^{Tax}(t); \, t \in (t^{beg.}, \, t^{fin.}\text{-}1]
\end{cases}
$$

provided that the above system of restrictions.

Thus, the problem of "three times" of vector optimization (by the set of optimization criteria, enterprises and time points) arose, which, as it is known, is fundamentally unsolvable.

It is necessary and permissible to scalarize, for example, translating all optimization criteria, except one, into restrictions.

Accordingly, a system of managerial tasks arises, the diversity of which is determined by:

- appointment of the logic of prohibitions on the liquidation of member enterprises of the corporate structure;

- limiting the completeness of the introduction of optimization criteria;

- choice regarding the translation of optimization criteria into restrictions;

- limiting the completeness of the introduction of managerial decisions (limiting part of the mechanisms, only their structure and / or algorithm);
- varying the length of the management period;
- variation of prohibitions on the state of the managed object.

This system variety, in particular, also displays:

- correlation of general and private management tasks;
- highlight the tasks of point optimization and optimization in the conditions of parameterization.

In our case, discrimination based on gradation of crisis will determine the optimization criterion by which tax transformations will be optimized.

Accordingly, three criteria versions of the managerial task are possible (naturally, the restrictions in all cases are substantially identical).

Criteria version 1. There is no crisis.

In this case, there is the task of maximizing the filling of the revenue of the consolidated budget:

$$I^{4,0}[J(t), C(t), t^{fin.}] + I^{5,0}[J(t), C(t), t^{fin.}] \rightarrow max.$$
$$T^{Tax}(t); t \in (t^{beg.}, t^{fin.}-1]$$

Criteria version 2. The crisis is present. Enterprises are saved.

In this case, there is the task of maximizing the cash balance of enterprises subject to conservation:

$$I^{2,m}[J(t), C(t), t] \rightarrow max; m \in [1, M]\}; t \in (t^{beg.}+1, t^{fin.}].$$
$$T^{Tax}(t); t \in (t^{beg}, t^{fin.}-1]$$

It is possible that in this case the classical problems of vector optimization can be avoided and the optimum will be in all criterion spaces at one point of the tax transformation operators (case of the so-called "universal" happiness). Otherwise, additional clarifications are required on the priority of the components of the optimization criterion.

Criteria version 3. The crisis is present. Rescue workers.

In this case, there is the task of maximizing the payroll for the enterprises to be preserved:

$$I^{6,m}[J(t), C(t), t] \rightarrow max; m \in [1, M]\}; t \in (t^{beg.}+1, t^{fin.}].$$
$$T^{Tax}(t); t \in (t^{beg.}, t^{fin.}-1]$$

It is possible that in this case the classical problems of vector optimization can be avoided and the optimum will be in all criterion spaces at one point of the tax transformation operators (case of the so-called "universal" happiness). Otherwise, additional clarifications are required on the priority of the priority components of the optimization criterion.

In the general case, the task in version 3 can be solved only after solving the problem of version 2, because otherwise, in the framework of purely tax administration, there is a paradox of subsidizing the employees of a bankrupt enterprise.

5.4 Procedure for Solving a Management Problem

There are three possible approaches to designing a procedure for solving a management problem:

- creation of a one-time procedure, designed and implemented in solving each specific management task in each specific condition, when performing each specific feasibility study;
- synthesis of an absolutely rigid procedure, which exhaustively prescribes the sequence of operations for processing information;
- development of a framework typing procedure that regulates phasing, semantic content and some general framework for the feasibility study.

Each of these three approaches has its own strengths and weaknesses.

So, in particular, one-time procedure is good:

- it allows not to produce large-scale, time-squeezed expenses for project coverage of all theoretically possible situations;
- it is extremely flexible, because de facto does not require correlation with analogues and prototypes;

- it provides the minimum tightness for executors of the feasibility study;
- it reduces the costs of protecting regulations as objects of intellectual property.

At the same time, it also has negative qualities, such as:

- increase in unit costs for one feasibility study, because each feasibility study should be accompanied by the indispensable development of a procedure for its implementation;
- increased risks of the contractor due to the expansion of the zone of intellectual responsibility;
- ignoring the errors of previous feasibility studies and the information that previously carried out feasibility studies;
- unacceptably strong dependence of the quality of the results on the quality of the contractor;
- excessively high requirements for the professional qualifications of the executor of the feasibility study;
- rise in price of a single feasibility study;
- lengthening the deadlines for a single feasibility study.

The rigorous feasibility study procedure is a prescriptive technology fully regulated sequence of processing operations with a prescriptive nature.

The disadvantage of a rigorous feasibility study procedure is, first of all, the denial of the advantages of a one-time procedure, and the advantage is the denial of the disadvantages of a one-time procedure.

The framework procedure for the implementation of the feasibility study is in the good sense of the term palliative. It is an option that is intermediate between one-time and rigid in terms of degree of regulation and final effectiveness. The framework procedure for the implementation of the feasibility study is a framework technology that significantly mitigates the shortcomings of one-time and rigorous procedures, but, of course, at the same time, it does not allow the private advantages of each of them to fully manifest themselves.

A logical analysis shows that according to the balance of the totality of negative and positive consequences, it is advisable to apply precisely the framework procedure for the implementation of the feasibility study of the considered nature.

In terms of meaning, the developed feasibility study technology provides for:

- allocation of typical operating units;
- establishing the sequence of implementation of operating units.

The staging of the components of the developed framework information and economic technology of the feasibility study is presented in the Figure 1.

The developed technology provides for the following interpretation of the feasibility study as an operational process:

- combination of secondary, adaptive content setting and formalization of the management task with the formation of requirements for the source data, obtaining these source data and finding the desired optimum;
- presentation and implementation in the form of a mandatory sequence of unconditional or conditional typical technological operations, some of which are preparations for an optimization computer experiment, some of them are carried out, and some of them are interpreted by its results.

From the components of the framework technology, it can be seen that several macro-stages can be distinguished in it:

- concretization of the content statement and formalization of the management task. In this case, their adaptation is a partial conceptual redesign taking into account the economic content of the real management task and the conditions for its solution. This redesign is usually localizing;
- generating a set of benchmarking strategies alternatives. Three generation options are possible. In the first option, the control subject is the Decision Maker (DM) or a specialized preparatory group forms an exhaustive list of alternatives, either heuristically or in accordance with the well-known procedures for planning a full factorial experiment or an optimal experiment. In the second variant, ranges of permissible variation and quantization step are indicated. In the third, this stage is combined with the forecast stage and the comparison stage, if the regular optimization procedure is applied;
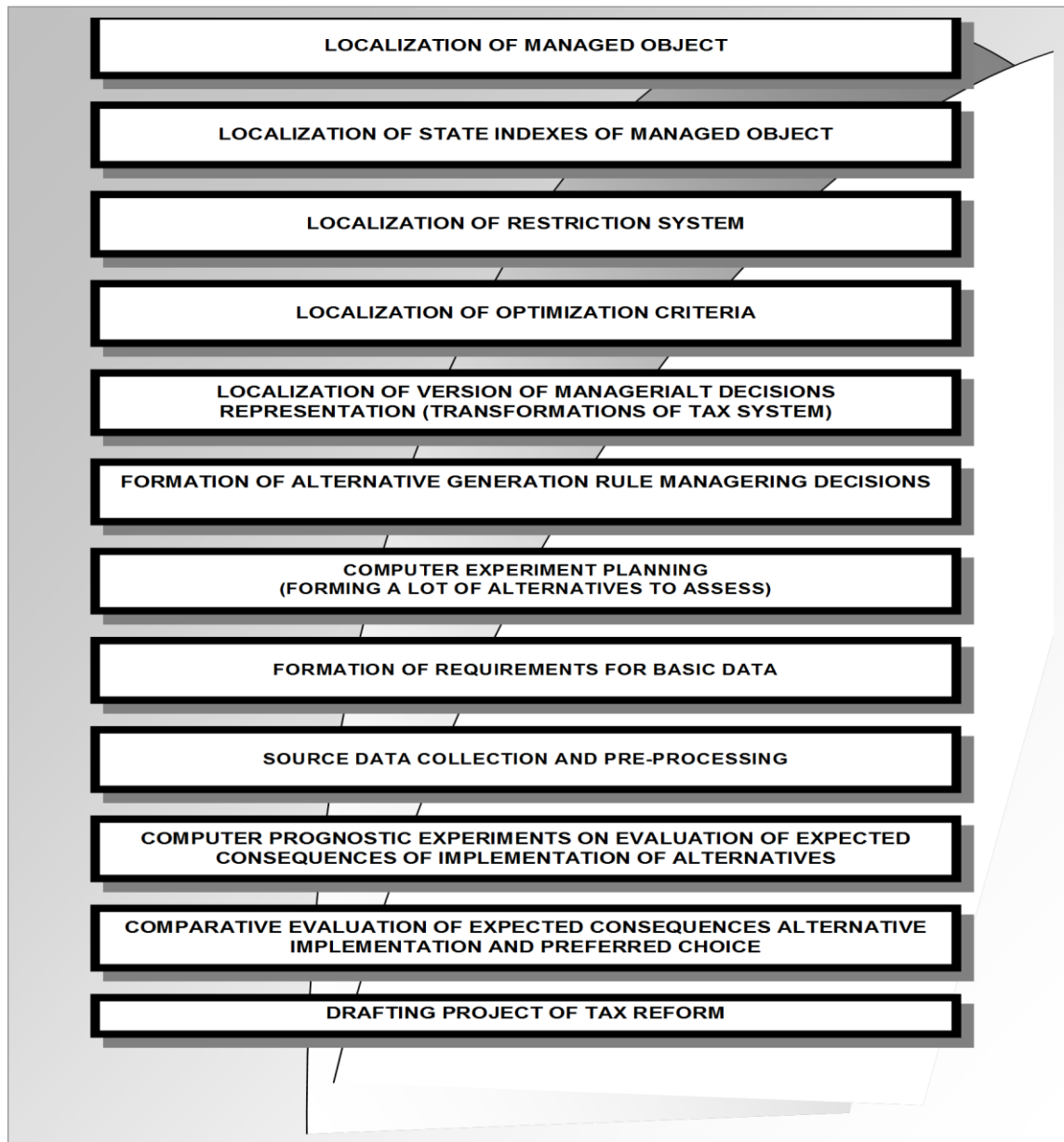
Figure 1. Framework information and economic technology of specialized feasibility study

Source: results of own author's research

- determination of the requirements for the source data, and sometimes indirectly, the primary information infrastructure with the subsequent implementation of their receipt and primary processing (for example, obtaining some statistical estimates from the primary samples, reducing to uniform dimensions, etc.);

- assessment of the expected consequences of the implementation of each of the alternative transformations of the tax system and their comparison, allowing to choose the preferred strategy from among those considered;

- interpretation of the results of the feasibility study in a form that allows direct interpretation by management personnel and the use of a managerial strategy for transforming the tax system in everyday management activities.

5.5 Demo Example of Optimization of the Tax System Component

Now we consider the optimizing tax managerial decisions for the case of the supply of some hypothetical high-yield commodity products for certain conditions.

We consider the triad of enterprises "manufacturer of complex technical products - leasing company - operator of complex technical products" (Bodrunov et al., 2004).

As indicators of condition and at the same time optimization criteria will be:

- net profit of the manufacturer, leasing company and operator, calculated on accrual basis;
- cash balance of the manufacturer, leasing company and operator.

Let there be deliveries of some Complex Technical Products (CTP) of one batch, which are carried out in the first year (hereinafter, all initial numerical data are hypothetical). Its value in value terms is defined as 4506 conventional units, and the leasing period is defined as 20 years.

The operator's income is set at 751 conventional units per year.

Let us also set the level of production profitability at the level of 15%, leasing profitability at the level of 10% and intended use at the level of 100%. The loan interest rate will still be considered appropriate to 10% per annum.

The forecast interval is defined at 5 years.

We will proceed from the fact that CTP under consideration is the only type of product with which the persons of the leasing triad operate.

We will not consider other types of investment operations (in addition to those associated with leasing).

As optimizing characteristics of the tax system, we consider the rates of Profit Tax (PT) and Value Added Tax (VAT). We assume that the characteristics of the tax system are identical for the manufacturer, leasing company and operator.

The corresponding plan of computational experiments is presented in the Table 1.

Table 1. Plan of computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13					
20			$\{E_i\}; i \in [1,25]$		
25					
30					
35					

For computer calculations, was used a model of the financial and economic state of leasing pseudo-corporations based on block-modular design (Dmitriev, 2002; Dmitriev & Novikov, 2019).

The obtained results of computer predictive experiments of some cost Conventional Units (CU) are in the Tables 2 - 7 and in the Figures 2 - 7.

Table 2. Forecast estimates of the total net profit of manufacturer for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	258.31	255.54	251.57	249.03	245.39
20	237.52	234.98	231.33	229.00	225.65
25	222.68	220.29	216.87	214.69	211.55
30	207.83	205.61	202.41	200.37	197.44
35	192.99	190.92	187.95	187.06	183.34

Table 3. Forecast estimates of the total net profit of leasing company for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	1948.21	1948.21	1948.21	1948.21	1948.21
20	1619.93	1619.93	1619.93	1619.93	1619.93
25	1385.44	1385.44	1385.44	1385.44	1385.44
30	1150.95	1150.95	1150.95	1150.95	1150.95
35	916.46	916.46	916.46	916.46	916.46

Table 4. Forecast estimates of total net profit of operator for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	701.98	230.56	-311.43	-615.72	-1062.89
20	599.15	196.29	-311.43	-615.72	-1062.89
25	531.87	174.25	-311.43	-615.72	-1062.89
30	470.22	154.05	-311.43	-615.72	-1062.89
35	413.77	135.56	-311.43	-615.72	-1062.89

Table 5. Forecast estimates of total cash balance for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	1458.31	1455.54	1451.57	1449.03	1445.33
20	1437.62	1434.99	1431.33	1429.00	1425.65
25	1422.68	1420.29	1416.87	1414.69	1411.55
30	1407.83	1405.83	1402.41	1400.37	1397.44
35	1392.99	1390.92	1387.95	1386.06	1383.34

Table 6. Forecast estimates of total cash balance of leasing company for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	4322.32	4322.32	4322.32	4322.32	4322.32
20	3994.04	3994.04	3994.04	3994.04	3994.04
25	3759.55	3759.55	3759.55	3759.55	3759.55
30	3625.06	3625.06	3625.06	3625.06	3625.06
35	3290.57	3290.57	3290.57	3290.57	3290.57

Table 7. Forecast estimates of total cash balance of operator for computational experiments

Rate of PT, %	Rate of VAT, %				
	10	12	15	17	20
13	701.78	230.56	-622.87	-1231.40	-2125.78
20	599.15	196.29	-622.87	-1231.44	-2125.78
25	531.87	174.25	-622.87	-1231.44	-2125.78
30	470.22	154.05	-622.87	-1231.44	-2125.78
35	413.70	135.56	-622.87	-1231.44	-2125.78

Thus, there are the following results of the experiments:

- financial and economic results of the enterprises-members of the leasing triad are significantly sensitive to the studied rates of value added taxes and income taxes;
- sensitivity to the value added tax rate is significantly higher due to low sales profitability;

- marginal level of the value added tax rate at which the leasing scheme is able to maintain the financial and economic potential of the enterprises members of the leasing triad is in the range of 12-15%, and not 20%, as established by the current system.
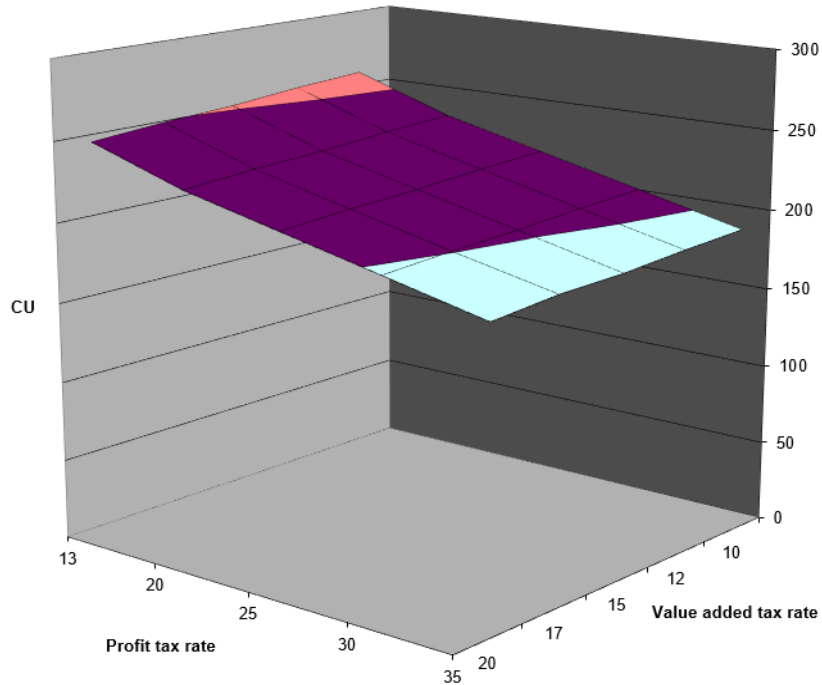

Figure 2. Value of the total net profit of the manufacturer
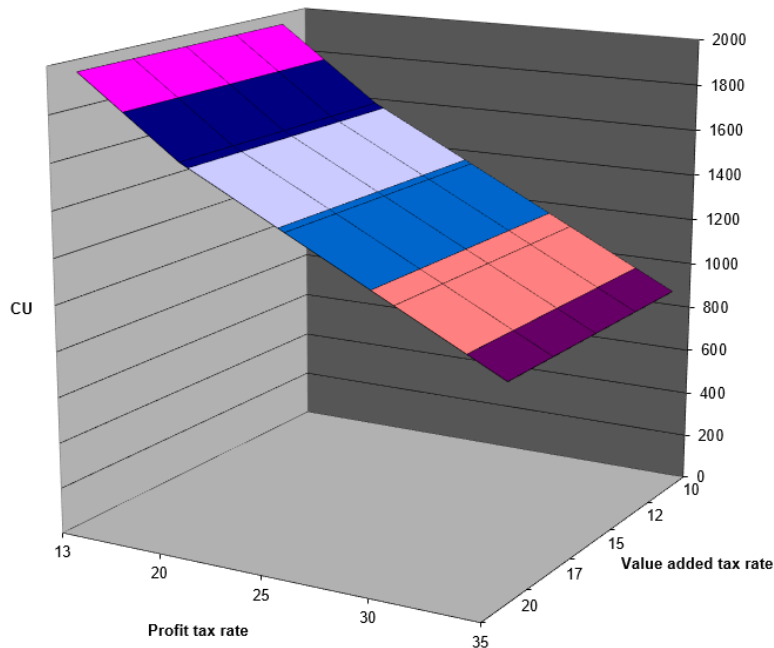
Source: results of own author's research

Figure 3. Value of the total net profit of the leasing company
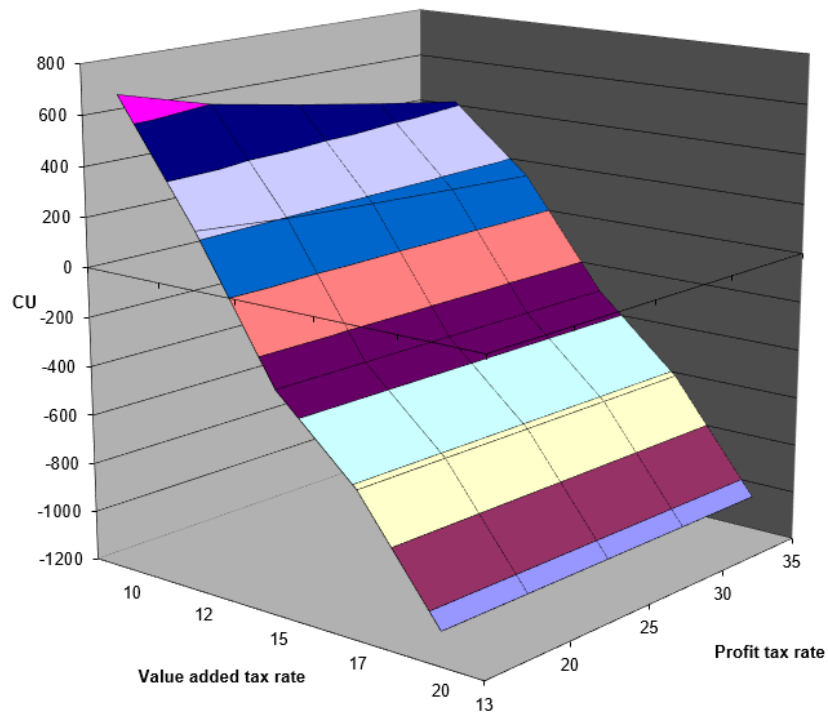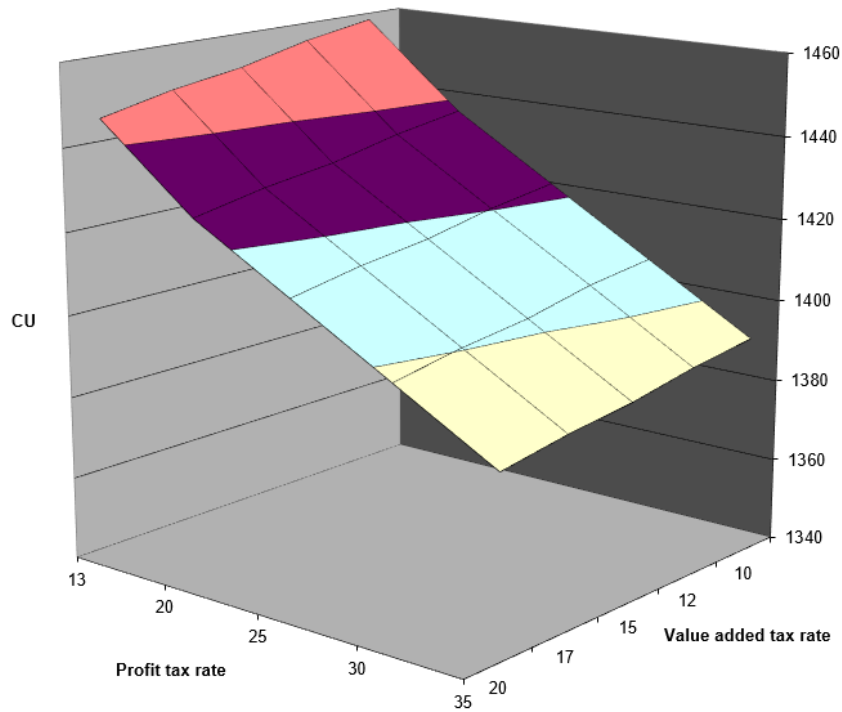
Source: results of own author's research

Figure 4. Value of the total net profit of the operator

Source: results of own author's research

Figure 5. Value of the cash balance of the manufacturer
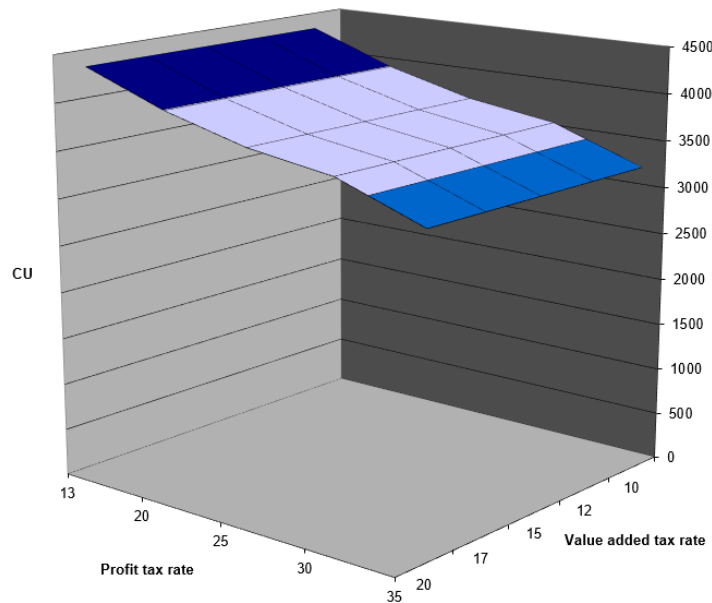
Source: results of own author's research

Figure 6. Value of the cash balance of the leasing company

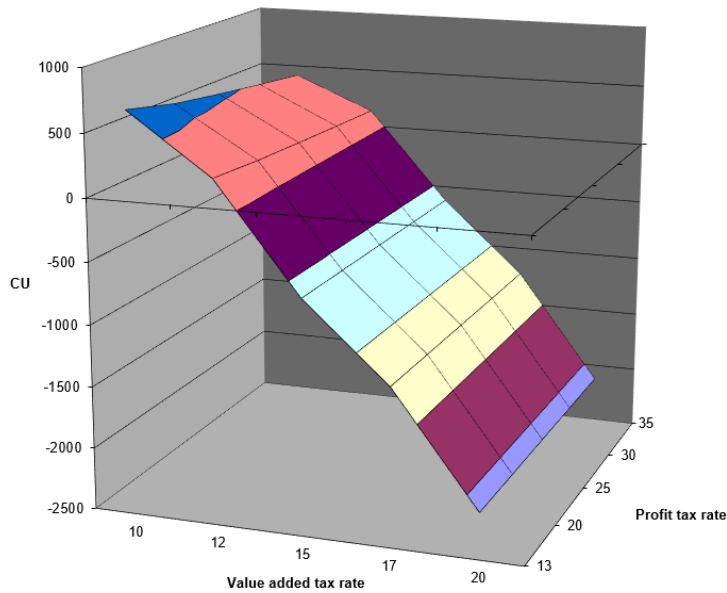Source: results of own author's research

Figure 7. Value of the operator's cash balance

Source: results of own author's research

5.6 Consolidated Recommendations on the Results of Specialized Studies

The developed semantic content of tax innovations implied the following:

- introduction of tax legislation of exclusively direct effect with the legislative prohibition of the establishment and execution of any legislative acts of a directive and administrative nature, as well as with the prohibition of interpretations of the law and its suspension by law enforcement (prosecutors, Ministry of the Interior, etc.) and judicial authorities (except, of course, Constitutional Court of the Russian Federation);
- fundamental reduction in the number of taxes and preservation of only three taxes:

- turnover tax such as current value added tax;

- cumbersome tax for profit-making legal entities (commercial and non-profit organizations, as well as persons with special status), the prototype of which is the current profit tax, and with an unchanged rate regardless of the size of taxable profit ("flat" tax);

- rental tax on the occurrence of ownership of natural objects: objects of society's assets (land, water, nature and subsoil use objects, atmospheric resources), which will be most associated with mineral extraction tax and land use tax;

- sharp decrease in tax rates. Thus, the feasibility studies have shown that the rate of value added tax, allowing at least non-degrading production, is not higher than 15%. The profit tax rate should not exceed the psychological 15-20% level, which still ensures the investment attractiveness of Russian high-tech production. The rental tax rate for mineral extraction should reach the level of 20-50% of the selling price of recoverable raw materials;

- exception to the practice of advance taxation including in respect of income taxable with value added tax (for example, advance payments), expected proceeds from export with deferred return, advance taxes, etc. In this case, when calculating the appropriate size of taxable bases, only payments made for goods shipped must be considered, taking into account its export or other addressing;

- exclusion of the institution of imputed tax;

- exclusion of tax reservations;

- unification of taxpayers with the exception of preferences for small enterprises, enterprises with employment of persons with disabilities, etc.;

- exclusion of entrepreneurial institutions without forming a legal entity, individual private entrepreneur, etc.;

- introduction of a full tax investment incentive in calculating the amount of profit tax;

- conducting a tax-free amnesty (amnesty without considering a tax offense in a judicial authority) and recognition of repaid payables for fines and penalties of taxpayers;

- introduction of a legislative procedure for the restructuring of tax arrears of taxpayers;

- introduction of a unified tax payment procedure and its procedural distribution for taxes and tax receivers;

- introduction of a unified description of taxes;

- legislative restriction of tax innovations to the period of the financial and economic period (corresponding year);

- exception of the formation of receivables for taxes returned by tax recipients to taxpayers;

- introduction of the right to fulfill taxpayer obligations by third parties;

- introduction of the syndicated taxation institution for enterprises - members of corporate structures (groupings).

5.7 Information About Testing Development

The development described above was applied in the formation of quite numerous proposals for reforming the tax system of the Russian Federation, although not all of these proposals were supported by persons with the right to legislative initiative. In addition, the proposed toolkit has been applied in the examination of a number of product, investment and innovative projects. Some of them were international. At the same time, in particular, it was revealed that the maximum allowable rate of value added tax at the level of 15%.

6. Conclusions

Based on the results of the core studies, it seems reasonable to conclude the following:

- formally, the tax system of any country includes from one to three categories of tax components (for the state in general it is mandatory, as well as, most often, for its territorial and administrative divisions and localities with possible regional localities). All individuals and legal entities are subject concerning this taxation. Along with this, intra-corporate (most often - intra-holding) and intra-company (entrepreneurship) pseudo-tax systems can be introduced and are actually being introduced in practice. Accordingly, any modern high-tech enterprise has no alternative to implement its entire life cycle in a tax environment with multiple tax systems: external (from one to four) and internal (from zero to one);

- tax system and its local components are one of the most powerful factors that generate or weaken economic crises at the micro, meso, and macro levels. It is a synergistic component that can generate, strengthen, weaken and stop economic crises. In this sense, tax management can have anti-crisis character;

- all these components of the tax system are highly variable and generate significantly different financial and economic consequences for high-tech enterprises. Accordingly, tax system as a whole and/or its selected components can and should be optimized-down to individual taxes and specific components such as tax rates;

- failure to optimize the tax system (complex or local) or its erroneous optimization is fraught with unacceptable financial and economic damage to high-tech enterprises and even, as a rule, their bankruptcy;

- any modern rational tax system can be formally represented by a set of operators with components typed in their formalized representation;

- high-tech enterprises have a number of regularity features, including the prolonged nature of the impact of the tax system. In contrast to enterprises with a short production cycle and a fairly primitive production and technological base, the administrations of high-tech enterprises should focus at least on the medium-term dynamics of the tax system (5-10 years). The preferred tax administration period is 10-20 years. Given the significance and duration of the impact of the tax system tax management decisions are clearly strategic for high tech enterprises;

- in order to optimize the tax system, a comprehensive and in-depth feasibility study should be carried out on the transformation of the tax system as a whole and/or its individual components. Thus, we should introduce a kind of system engineering design of managing systems: tax system engineering. This justification should be based on computer experiments with software implementation of the mathematical model of the enterprise or their grouping;

- concept of a feasibility study for the transformation of the tax system is invariant in relation to the specifics of the country and the implementation of its tax system. Its localization is determined solely by the specifics of taxes;

- acting tax system of the Russian Federation has a number of conceptual and implementation unacceptable disadvantages, and therefore must undergo significant transformation. Familiarization with other modern tax systems (in other countries) gives grounds to state that, firstly, they have many similarities to the Russian shortcomings, and, secondly, they are unacceptably far from ideal;

- tax system is subject to parameterization by the crisis factor. Optimization of the tax system should be carried out in the presence and absence of a crisis within the framework of various optimization tasks;

- as part of the system engineering design of the tax system optimization tool, optmization task should be formulated and formalized in a meaningful way;

- this problem has a number of versions that differ in criteria spaces, including for the case of a crisis. The anti-crisis tax administration should be aimed at preventing the bankruptcy of a high-tech enterprise. Other criteria are considered as unrepresentative;

- proposed system-technical view of the optimal taxation problem allows optimizing the tax system in various modes (comparing of fixed variants and regular optimization) and it is a template for the corresponding tasks;

- testing of the development confirmed its feasibility, non-triviality of the results and their consistency with the financial and economic laws of operating in the tax sphere;

- one of the critical and promising areas of research in this area is the development of a conceptual technology for integrated tax management (for the five circuits listed). In this case, we are looking at non-trivial versions of the problems of active systems and third-party optimization.

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