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Concepts, strategies and mechanisms of economic systems management in the context of modern world challenges

Scientific monograph

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COORDINATION OF BUSINESS PROCESS MANAGEMENT WITH STRATEGIC DEVELOPMENT OF COMPANIES

In economic-mathematical model researches, for example [1; 2], dating back to the mid XX century, the method of expert estimates was used to build economic models, as well as mathematical statistical ways, while putting stress on the drawbacks of the forementioned approach. Thus, the paper [2, p. 8] showed that "with all the importance and necessity of using the peer review method ... it suffers from at least two disadvantages. The basis of this method is the specialist-expert's experience and "business intuition" of the one who conducts the assessment, i.e. the factors depend to a large extent on the subjective ideas of the person. This method is currently widely used because of the fact that the mathematical and statistical techniques are poorly used in practice, because they have little interaction with the specificity of macromodels of reproduction".

Building a dynamic model of sustainable development is based on modeling the mode of operation and development of a given economic system as a method of assessment (measurement), which allows to combine the diversity and conditions of the decisions taken, the characteristics of the uncertainty of the economic system with the variety of end results, with the characteristics and properties of uncertainty of this economic system functioning. The idea of building dynamic models for the effective mode of the system implementation functions was firsgien in the researches done by Prof. I. M. Syroezhina and developed on in the theory of organizational and economic dimensions [2; 3]. The essence of the approach is the following.

The activity of any economic system is the choice and implementation of an arbitrary set of connections from the many potentially possible, as well as maintaining or breaking the existing relationships. A multitude of the implemented connections in the transition of the system from one state to another is characterized by the concept of "mode of activity". At any given time, the economicentity can be in one of two states (modes): operation mode (stable set of connections) and development mode (set of changing).

The activity mode of the economic system may be represented by a certain number of economic indicators. Each certain indicator can be compared with the the certain mode (taking into account the comparability requirement and the need to include the dynamics elements) and the rate of growth (increase) of indicators.

Using the growth rates rankings, one can build an order that is capable of producing the requirements for the better operational mode and can act as a benchmark. This order is called the regulatory system of indicators that is a system of indicators organized in terms of growth in such a way that maintaining this order for a long period of time provides the best mode of operation of the economic system.

The regulatory system of indicators is a model of the reference mode of functioning of the economic system. Any actual order of indicators can be compared to the normative way of calculating the rank correlation coefficient between them.

The enterprise's focus on improving its efficiency and stability can be described by developing specific target guidelines. It should be noted at the same time that the requirement to consider the

enterprise as a dynamic system, which brings about the need to formulate not the “goal-state”, but “goal-direction”, such as “to reduce the number” or “to increase working capital”. In this regard, the formulation of the purpose of the economic policy of the enterprise does not require the establishment (at the first stage of decision making) of absolute indicator levels, moreover, it is neither necessary to establish the measures for their movement (growth rates). Target guidelines can be obtained by ordering indicators of the state and performance of the enterprise. The purpose of management will be to maintain this order. By purposefully designing and controlling the indicators' dynamics, it is possible not only to determine the direction of movement of the economic system, but also to manage this movement to achieve the set goals.

Obviously, the criteria for selecting the requirements for the best mode of operation may be different. In particular, such a criterion can be to support the (growth) sustainable development of the enterprise. The developed models of sustainable development should serve as a point of reference when assessing the actual mode of operation of the enterprise, a guideline for the strategic and financial decision making. The principle of comparability requires building such a quantitative model that would allow the comparison of any two modes of operation of the enterprise with each other. The modes are to be compared by calculating the following integral estimate [4]:

$$E = 1 - \frac{\sum_{i=1}^{n} m_i}{n(n-1)}, \qquad (3.1)$$

where: E is the estimate of the economic system’s mode of operation;

n is the number of indicators in the dynamic model of sustainable development;

m_i is the number of inversions in the actual sequence for the indicator with rank i (taking the i-th palce) in the dynamic model:

$m_i = \sum_{j=1}^{n} a_{ij}$,

where: a_{ij} is a variable indicating the presence / absence in the actual indicator ordering of the "faster" binary ratio between the i-th j-th indicators set in the standard ($i=1, ..., n; j=1, ..., n$):

$a_{ij} = 1$, *if* $r_i > r_j$ when $i < j$;

a_{ij} = - *1, if* $r_i < r_j$ *when* $i > j$;

0 in other instances,

where r_i and r_j are the ranks of the i-th j-th indicators in the actual arrangement.

If we denote the sum of inversions in the real order of indicators (*P*) relative to the normative order (*H*) given in the dynamic model $\left(\sum_{i=1}^{n} m_i\right)$ in the form *M(P, H)*, then the expression (3.1) can be given as the formula:

$$E = 1 - \frac{M(P,H)}{n(n-1)}, \tag{3.2}$$

The esmate *E* ranges from 0 to 1. The coincidence of the actual and the given normative order of indicators prove the absolute level of implementation of the company's economic strategy, which is aimed at ensuring its maximum stability. In this case, all normatively specified ratios of growth rates of indicators are actually fulfilled, and $E = 1$.

The actual order of indicators, opposite to the standard one, gives an estimate of $E = 0$. The closer the estimate is to one, the greater the proportion of the set normative ratios between the indicators is implemented in the company's business.

A generalized estimate of the mode of operation of the economic system E characterizes the degree of approximation to the ideal and does not depend on the results achieved in the past. This is a kind of strategic estimate, as it shows the level of achievement of strategic goals of the economic development, set in the dynamic model of the benchmark mode of functioning of the business system.

When building dynamic models of sustainable development, there are several ways to rank indicators and build a regulatory mode:

– qualitative analysis of indicators and their arrangements;

– building dynamic models of sustainable development based on a constructive representation of the system and its mode of operation;

– a pairwise comparison of indicators and the construction of a dominance matrix;

– building dynamic models of sustainable development based on the “creative profile” model.

In general, we can distinguish the following basic stages of building a benchmark (normative) arrangement of indicators [5]:

1) defining a dynamic model of sustainable development in the study of the company's management system;

2) identifying the functions and goals of the management system;

3) selecting a system of indicators that reflect the level of implementation of the function of the management system;

4) building a benchmark arrangement of indicators, taking into account the priority of their growth in order to achieve the goals of functioning of the business system.

Typically, two types of standards are considered – linear and nonlinear, which reflect the corresponding orders of growth of indicators: the type of arrangement is determined depending on the purposes of analysis and features of a particular system [6].

In practical calculations, the dynamic model of sustainable development is more often given in the form of a matrix of normative ratios of indicators' growth rates, that is, in the form of the matrix E_{NxN}, the elements of which are determined under the following condition:

$$e_{ij} = \begin{cases} +1 \leftrightarrow T_i > T_j; \\ -1 \leftrightarrow T_J > T_i; \\ 0 \leftrightarrow T_j ? T_i; \end{cases}$$

where: T_i, T_j are growth rates of "i" and "j" indicators;

$T_i > T_j$ is the normative arrangement of the growth rates;

T_i ? T_j means the normative ratio hasn't been established.

Formally, a dynamic model of sustainable development is a binary ratio based on a large number of indicators. This ratio can:

– satisfy the condition of transitivity ($A>B \cup B>C \rightarrow A>C$);

– not contradict it ($A>B \cup B>C$ when A is not equal to C);

– contradict it ($A>B \cup B>C$, but $C>A$).

We will call the dynamic model of sustainable development transit in the first two cases, the first case being called complete transitivity. In order to calculate the estimates for the dynamic model of sustainable development for each analyzed period $t \in [0; T]$ we

build the F^t_{NxN} matrix of actual ratios (growth of indicators), the elements of which are determined under the following condition:

$$f_{ij}^t = \begin{cases} +1 \leftrightarrow T_i > T_j; \\ -1 \leftrightarrow T_j > T_i \; for \; \forall t; \\ 0 \leftrightarrow T_j ? \, T_i. \end{cases}$$

The calculation of estimates of a dynamic model of sustainable development is based on the idea of calculating the number of inversions between orders of rates. The inversion is meant to be a change of the rank of the rate in one order relative to another.

For each analyzed period $t \leq [0; T]$ we build a matrix of "non-inversions" of the actual and benchmark ratios of the rates *BtNxN*, whose elements are determined by the following condition:

$$b_{ij}^t = \begin{cases} 1 \leftrightarrow \left| \begin{matrix} e_{ij} = +1 Y \int_{ij}^t = +1 \\ or \; e_{ij} = -Y \int_{ij}^t = -1 \text{ для } \forall t; \end{matrix} \right. \\ 0 \leftrightarrow in \; other \; instances. \end{cases}$$

The question of the choice of equalities ($F_{ij} = \pm 1$) or inequalities ($F_{ij} \geq 0$ або ≤ 0) in the formula for determining elements of the *B* matrix remains open. However, in practical calculations, the cases of equality of growth rates are extremely rare, so the solution to this question is rather more methodical.

The sum of the elements of the matrix *B* is equal to the number of normative rate ratios fulfilled (in the analyzed period). Since the number of the established regulatory ratios is equal to the sum of the modulus of the elements of the matrix of the dynamic model of sustainable development, the assessment of stability can be calculated as the proportion of completed regulatory ratios in the total number of established ones:

$$E^t = \frac{\sum_{i=1}^N \sum_{j=1}^N b_{ij}^t}{\sum_{i=1}^N \sum_{j=1}^N |e_{ij}|} \; for \; \forall t, E \in [0; 1]. \qquad (3.3)$$

To build a dynamic model for the sustainable development of a trading company, as noted above, it is necessary to make a ranking of

sustainability indicators. While conducting this research, we formed and ranked a system of indicators, reflecting the level of performing the functions and goals of the business system of trading compasnies. The method of expert assessments was applied [7]. The respondents (leading trade professionals) were asked to rank the selected sustainability groups (financial, technological, social, information and environmental). The results of the data processing of the expert estimates and their generalization are shown in Table 3.2.

Table 3.2

The companies' sustainable development indicators ranking

№	Group of indicators of the trading company development sustainability	Indicator rank
1	Indicators of the trading companies' financial sustainability	1
2	Indicators of the trading companies' fixed assets renewal (technological sustainability)	2
3	Indicators of the level of the trading companies employees' wages, their social security (social sustainability)	3
4	Indicators of the level of development of the trading companies' information system (information sustainability)	4
5	Indicators of the trading companies' environmental sustainability	5

Based on the results obtained, we propose the following sequence of ranked growth rates (in other words, the order of their movement or the dynamic standard), which reveals the generalized groups of indicators of the trading companies' sustainability (Table 3.3).

Table 3.3 presents the dynamic ordering of the trading companies' performance indicators which reflect regulatory requirements for sustainability. The general ordering of indicators by the rate of their growth (T) reflects the model of the most sustainable mode of activity of the company. The above growth rates show the changes of the eponymous indicator at the end of the reporting period compared to its value at the beginning of the reporting period or the ratio of the forecast value to the basic one.

Table 3.3

The dynamic ordering of the trading companies' performance indicators

Rank	Indicators	Group of indicators
1	E – equity	Financial sustainability
2	CFA – current financial assets	
3	FA – financial assets	
4	EA – economic assets	
5	NFA – non-financial assets	
6	NMP – non-monetary property	
7	LC – loan capital	
8	FAS – fixed assets suitability	Technological sustainability
9	FAR – fixed assets renewal	
10	AFA – additions to fixed assets	
11	IFC – investments in fixed capital	
12	CP – commercial products	
13	APFA – active part of fixed assets	
14	FAV – fixed assets value	
15	FAIP – fixed assets for industrial purposes	
16	PC – production costs	
17	MIF – material incentive fund	Social sustainability
18	PF – payroll fund	
19	NHQP – the number of highly qualified personnel	
20	NTS – the number of technical staff	
21	NSA – the number of shop assistants	
22	PS – staff sustainability	
23	PA – payroll arrears	
24	ENWC – ensuring normal working conditions	
25	NTIIS – the number of tasks that are solved in the integrated information space	Information sustainability
26	SRRC – speed of response to a request or complaint	
27	PEIS – the percentage of employees who use the information system tools and resourses in their official duties	
28	RST – resource-saving technologies	Environmental sustainability
29	EP – environmental pollution	
30	ECM – environmental conservation measures	

Financial model of the trading company's sustainable development. When forming a financial model of sustainable development of a trading company, it is advisable to take into account only the internal factors of companies' financial sustainability. The reason for this decrease in the number of factors is explained by the rapidly changing external conditions of trading business. There is no doubt that the growth rate of equity capital should be a maximum value that exceeds other indicators, and the growth rate of borrowed capital, on the contrary, a minimum value.

Thus, we believe that all property (*EA*) should develop at a higher rate than debt capital (*LC*), but slower than equity (*E*):

$T(E) > T(EA) > T(LC)$.

At the same time, equity (*E*) is directly related to non-financial assets (*NFA*) and all non-monetary assets (*NMP*), and loan capital (*LC*) to financial assets (*FA*) and monetary assets:

$T(E) > T(NFA) > T(NMP)$;

$T(E) < T(FA) < T(CFA)$.

Thus, the overall model of growth in financial sustainability can be presented in an expanded form regarding that the proportions and trends of development are distributed from the maximum to the minimum value, and each of the considered indicators gets a corresponding place in the overall chain:

$T(E) > T(CFA) > T(FA) > T(EA) > T(NFA) > T(NMP) > T(LC)$.

The proposed financial model of a trading firm's sustainable development growth firmly associates its own property with debt, financial assets with non-financial ones, a monetary form with a non-monetary one. A special place is given to its own resources in the form of money and compliance with the condition of financial equilibrium as a key in strengthening the financial position of a trading company.

Technological model of the trading company's sustainable development. Based on the requirement to reduce costs associated with the production and sale of goods, the following ratio should be relevant:

$T(CP) > T(PC)$.

This ratio of indicator dynamics provides the reduction of expenses and, accordingly, opportunities to increase the company's profit. The indicators characterizing the trading company's technical

equipment set are the value of the enterprise's fixed assets (*FAV*), the active part of the fixed assets (*APFA*) and the fixed assets for industrial use (*FAIP*). The indicators characterizing the trading company's technical equipment set are the value of the enterprise's fixed assets (*FAV*), the active part of the fixed assets (*APFA*), the fixed assets for industrial use (*FAIP*). The forward growth of the active part of fixed assets in relation to the overall growth of fixed assets, as well as to the growth of fixed assets for industrial purposes, is better than the backlog, which causes the risks associated with being poorly technically equipped.

Regarding fixed assets for industrial and non-production purposes, it is obvious that their increase in non-production assets should not outstrip the increase in the value of industrial assets, which may cause the risks associated with the inefficient structure of fixed assets.

Given both statements, we obtain the following regulatory ratio:

T(APFA) > T(FAIP) > T(FAV).

Information model of the trading company's sustainable development. The generic indicators that characterize the development of a trading company's information system are the number of tasks that are performed in the integrated information space (*NTIIS*), the speed of response to a request or complaint (*SRRC*), the percentage of employees who use the information system resources while performing their duties (*PEIS*).

The growth rate of the number of tasks that are fulfilled in the integrated Information space (*NTIIS*) in large commercial firms is, in our view, the most important. Fulfilling a large number of tasks in the integrated information space allows achieving the maximum level of coordination for a managed system. The rate of time reduction required to respond to requests or complaints (*SRRC*) typically characterizes the level of a technical equipment set of the information system used by a trading company. The growth rate of the percentage of employees using the resources of the information system *T(PEIS)* reflects the level of the trading company's information system technical and software components development:

T(NTIIS) > T(SRRC) > T(PEIS).

In the course of the research the elements of the organizational and economic mechanism of process management were harmonized

with the strategic priorities of the trading company, while the proposed system of indicators of sustainable development can be adopted as a basic element of the mechanism of the process management for the trading company.

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