Technical and technological aspects of Russia's digital economy development.

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Abstract. The paper discusses the essence and effectiveness evaluation, the essence of the idea of the effect and effective activity, as well as aspects of effective management. The authors state that control effect is the sum of three components. Besides the effect concept, the notion of effectiveness is widely used. However, effectiveness of management styles cannot be evaluated outside of particular situations. The paper dwells on criteria that must be taken into consideration and the concept “general efficiency. The authors stress that effectiveness of the organization is determined by the number of parameters, such as external environment, market condition, ecological safety, the focus on advanced technologies, etc. The authors also identify four main model groups of assessment of the efficiency. In addition, the paper analyses the firm management cycle and the corporation management cycle, as well as stages of management according to certain objectives.

1. Introduction

The efficiency of organization: the essence and effectiveness evaluation. One of the main tasks in high-technological economic sectors, one of which is an information-computer direction, is the transformation of material, labor and financial resources into goods and services. For successful and full achievement of this goal, the organization must provide these transformations not only with the profit for consumers but for itself. In other words, the expenses for the transformation must be less than the result price. That is the essence of the idea of the effect and effective activity [1].

A good manager must view the organization as a system of interdependent elements which functioning effectiveness depends on its own continuous movement and development. He can also choose the necessary performance indicators, interpret them correctly and analyze the efficiency of the organization on their basis. The analysis should be conducted in general as well as by separate elements, and according to the results obtained a manager should make an administrative decision that allows the organization to succeed [2, 3].
2. Theory

The effectiveness of the organization is considered to be the index that determines its responsiveness and efficiency [4]. Economists distinguish between the following aspects of effective management in their management literature:

- **internal efficiency**: it is an organization efficiency considered from the point of view of using the internal resources of the organization;
- **external efficiency**: it determines an organization efficiency from the viewpoint of using the external opportunities and its dependency on outer factors which influence organization activities;
- **general efficiency** is a combination of the internal and external efficiencies;
- **market efficiency** demonstrates the ratio of consumer satisfaction with the product to the alternative ways to satisfy the need for these services or goods;
- **perfect efficiency** is a “phantom”, a perfect type to aspire to in spite of the managerial efforts to optimize the organization structure. Such efficiency in considered to be unachievable under no circumstances;
- **target efficiency** reflects the extern of goal achievement of the organization;
- **cost-effectiveness** reflects the efficiency of the ways of resource transformation as a result of industrial activity of an organization;
- **the global efficiency of the economy** is the consequence of the ways of economic system functioning on a micro-level organization [5, 6].

3. Effect and efficiency concepts

Management efficiency is a complex and diverse concept which essence is as follows: the whole managerial process should be conducted at the lowest cost or with the greatest performance starting from the goal-setting and ending with the final outcome of the activity. The main criteria of effective management are the plurality of indices that characterize the effectiveness of working organization systems and subsystems. The end result of the management is often called a control effect [7].

This effect is the result of activities aimed at the perfection of manufacture, business and organization as a whole. The control effect is the sum of the three components:

- **an economic effect**. It has a direct cost form, so it is measured in money and natural meters;
- **a socio-economic effect** combines an economic benefit with social stability and social peace. For instance, it can be the improvement of working conditions, the decrease of the level of occupational diseases. A socio-economic effect can be transformed into an ordinary economic effect under certain conditions [8];
- **a social effect** is non-quantitative and cannot be recounted in an economic one. The prevention of a social conflict can serve an example.

A general effect can be conditionally taken as a sum of the three effects. “Conditionally” is the key word because the indices of the effects are measured differently and it is impossible to add them up directly. Besides the effect concept, the notion of effectiveness is widely used. The effectiveness is the result that is expressed in value indicators and is the economic effect characterized by a revenue growth and a profit increase. The effectiveness (Ef) is the ratio of the effect of the achieved result (R) and the costs of their achievement (C). The maximum reduction of costs and the maximum increase of all the effects mentioned above are the goals of management. The costs are inhomogeneous and are not always money in its pure form (though their transformation in monetary form is desirable).

The costs are subdivided into:

- material costs (raw material and energy, semis);
- labor costs (working time and qualification of specialists);
- financial resources, money or some equivalents (securities, for example).

The effectiveness can be increased by decreasing of some of the resources mentioned and the ways to do it are various. Management efficiency is provided with the cost of an optimization activity and
effectiveness increase in all managerial directions:
- in human resources management;
- in production management or in the creation of an operating system;
- in determining managerial methods and structures.

The success of a management style can be evaluated by impact on profits and expenses. When estimating it one should use several criteria connected with the tasks. They are as follows: product development, organizing, human resources management (the duration of absence, job satisfaction and willingness to change jobs, a sense of dignity, creative abilities, an initiative and willingness to study). Moreover, the application management styles has certain limitations (such as legal and ethical values of business).

The effectiveness of management styles cannot be evaluated outside of particular situations. The following criteria should be taken into consideration:
- personal qualities (the ideas about the values, self-consciousness, the main viewpoint, an attitude to risk, the role of personal motives, authority, productive and creative potential, educational level [9]);
- dependency on the challenges ahead (if they contain creative or innovative techniques, the degree of formulation, experience availability in their solution, if they are solved according to the plan or as suddenly arising; if they must be done in groups or individually; deadline pressure);
- organizational conditions (degree of rigidity of the organizational structure, centralized and decentralized problem solution, the quantity of the authorities responsible for decisions making, the clarity of the information and connection paths, the control level);
- environmental conditions (stability level, conditions of material security, social security, prevailing social values and structures).

An organization is considered to be successful if it has achieved its goal. The components of the success of the organization include survival ability, the effectiveness and efficiency, practical implementation of the decisions made. The efficiency can usually be measured and expressed quantitatively because it is possible to make a monetary evaluation of its inputs and outputs.

Relative efficiency of the organization is called production performance. The performance is expressed in quantitative indices. The performance at all the levels of the organization is a crucial factor for its survival and ability to succeed in competitive conditions [10].

Managers decide on the goals of organizations performance, on the methods to obtain the product and the forms of stimulation to make workers interested in the productivity increase.

A functional system providing the necessary management efficiency should be related to progressive systems. Its essence is as follows: functional management services specialize in homogeneous types of activity, such as planning, marketing, design, production technology, rationing of labor, etc. Such system leads to the weakening of management centralization which in its turn is the reason for undesirable phenomena (depersonalization, multiple authority, irresponsibility, etc.). Leading western management consultancy firms actively put in practice and develop the management methods that consider the achievement of the highest possible Market Value Added (MVA) of the enterprise or its separate departments among the criteria of successful management activity on different levels.

The approach mentioned has been termed the management based on the value, or VB management (Value Based Management). VBM approach is related to advanced financial management. Depending on the significance of financial indices, it can be divided into two groups of methods. Financial bias is characteristic of Economic Value Added (EVA), Share capital Value Added (SVA), Cash Flow Return on Investment (CFROI), Cash flow Value Added (CVA), Option Price formation (OPM) and some other.

However, some authors point out that analysts are guided by non-financial criteria in 30% of cases and take into consideration the quality of management and its ability to implement the strategy. These features as well as financial performance let us consider the Balanced Scorecard (BSC) method as increasingly close to the managerial thinking.
4. General efficiency

To discover the essence of the concept “general efficiency”, we will use a conditional formula of the general view:

\[ X = X_1 \cdot X_2, \]

which lets us unambiguously interpret such complex and ambivalent concept making this interpretations quite visual. The dependency of the level of organization general efficiency on this or that level of its components can be conditionally presented as follows:

\[ E = E_1 \cdot E_2, \]

where \( E \) stands for general efficiency level, \( E_1 \) means the level of external efficiency (the degree of use of market opportunities) and \( E_2 \) defines the internal efficiency level (the degree of use of inner opportunities).

We can draw a conclusion that to obtain maximum results the organization needs to realize its market opportunities to provide most comprehensively and the highest possible level of its external efficiency.

The production of goods obviously having no demand at the market makes any efforts on increasing the efficiency of the production = manufacture pointless. On the other hand, the manufacture of best-selling goods at the low level of efficiency (because of high operating costs or high production cost) will lead to the reduction in demand and to the decrease in the share of the market.

5. The performance indicators of the organization

The effectiveness of the organization is determined by the number of parameters. It is not enough to estimate the effectiveness of the firm functioning only by its economic achievement, for example, by the gained profit. A huge profit can be received by severe exploitations of workers and by using modern methods of production organization with the help of social and psychological factors. For us it is crucial to study the second, humane approach to achieve the efficiency. The effectiveness of the organization is evaluated comprehensively on the two blocks of parameters.

The first block contains objective economic indicators:
1) effectiveness (if the organization has achieved its goals);
2) performance (if the goal is achieved by minimum labor costs);
3) productivity (the quality and the quantity of goods);
4) profitability (profitability index in the process of trade from the purchase of raw materials and equipment to the sale of manufactured goods);
5) ecological safety (environmental pollution is one of the main parameters of inefficiency of an industrial enterprise);
6) energy intensity (the index of energy consumption during technological process characterizes the effectiveness of the enterprise as a whole);
7) the second block includes all subjective indices (psychological, physiological, and social);
8) labor, spiritual and social activity of employees;
9) activity is an operational component of human psychology. Labor activity reflects on such indices as labor productivity and product quality. Spiritual activity of people is determined not only by their professional qualifications but by creative attitude to work and participation in rationalization activity. Social activity becomes apparent in the participation in the social-political life of the country, social movements in the development of new economic conditions. An activity level shows the standard of psychophysical and socio-psychological vital activity of employees. The level of socio-psychological activity is estimated by the following parameters:
   - the fact of labor, spiritual or social activity;
   - the time spent on the activity;
   - expression of initiatives in labor, cognition or social behavior;
10) Job satisfaction (it is the index of a personal attitude of a human to labor and to the members of the group);
11) Relative stability of the organization (the tendency to form kernels of personnel workers, the rest of the staff are concentrated around them). Stability indicator is connected with the employee
turnover indicator. A certain level of employee turnover is a normal phenomenon for each enterprise. If
the group is absolutely stable for a long time, it influences its development, the relationships between
people and the creation of new ideas negatively. That is why we speak about the relative stability of the
organization bearing in mind the importance and the necessity of certain staff turnover.

12) The harmony of the organization (it characterizes the stability and durability of interpersonal
interaction). The psychological state of the system of functional interaction of employees is estimated.
The harmony of staff members shows the well-defined coordination of organizational and psychological
mechanisms of their activity. It serves a prerequisite of the unity and the compatibility of staff members.

13) Studies of social psychologists at industrial enterprises show that the complex evaluation of
organization performance can be conducted only in case of the subjective and objective factors taken
into consideration. Y.P. Platonov determines the following socio-psychological factors on the basis of
special literature analysis and his own multiyear studies:

1. purposefulness (readiness of the organization to achieve the goals of the collaborative
interaction). The purpose of collaborative interaction expresses the needs, the interests and the value
orientations of staff members, their perfect image of the prospective result. All these determine the
means and ways of interaction;

2. motivation (it reveals the reasons for labor, cognitive and communicative activities of group
members). Motivation performs three functions in a definite situation of social interaction: inducing,
guiding and regulatory ones;

3. emotionality (it is an emotional attitude of people to interaction, first of all in the specifics of the
emotional and informal relationships within the organization);

14) assessment models of the effectiveness of the organization.

The determination of the degree of the effectiveness of the operation of business is a very important
task for the enterprises, customers and suppliers, financial institutions and other subjects of the market
economy. The results of the evaluation activity allow the managers to estimate the prospects for further
movement, to identify problematic areas, to analyze the effectiveness of the chosen development
strategy of the firm.

In modern economic conditions it is necessary for the economic performance indicators to take into
consideration all the relevant parameters of the external environment, including market condition,
ecological safety, the focus on advanced technologies, etc. For the assessment of the contribution to
economic efficiency of separate elements of the enterprise as well as for the evaluation of the
effectiveness of activities conducted, it is necessary to possess an appropriate set of economic
instruments.

According to some western scientists, the use of numerous assessment models gives the most
significant result in analyzing the efficiency of the company.

The concept “assessment models” includes a wide range of methods which can be conditionally
divided into several groups. It is important to point out that while assessing the efficiency of company
activity specialists rarely limit themselves only with strategies from one group [6]. On the contrary, a
qualified manager will try to use a lot of various methods with the view to get the most accurate results
describing the changes achieved during the company’s activity. Foreign authors (Nickols, 1999; Clark,
1997; Stufflebeam, 2001; Trochim, 2001) distinguish four main model groups of assessment of the
efficiency:

- scientific-experimental;
- the models aimed at the study of management system;
- participant-oriented models;
- quality/anthropological.

Scientific-experimental models are traditionally used in practice most often. Their evaluation criteria
and implementing methods are taken from scientific experience, especially in the field of social sciences.
The accuracy of the information obtained is the priority principle for these strategies. Economic
methodologies including cost-effectiveness and cost-benefit analyses as well as some other methods of
theoretical scientific evaluation are most popular ones.
**Models aimed at the study of management system.** There are two main strategies to be distinguished in this group. The first one is Programmed Evaluation and Review Technique strategy (PERT) implying evaluation and revision of plans with the use of network models as well as planning and management methods. The second one is a Critical Path Method (CPM) which represents a network planning technique, determining the length of the project by analyzing which operation sequence has the least flexibility for planning that is possesses the least allow time. Both the strategies are widely used by contemporary western private and government institutions.

**Participant-oriented model.** Participant-oriented methods focus the researcher’s attention on the participants of the estimation, first of all on the customer for whom the research is conducted or on those who will use assessment results further. A stakeholder-oriented method can be an example of such strategies (any group or an individual able to influence organization is defined as a “stakeholder”).

**Quality/anthropological.** A peculiar property of this group is attaching great importance to observation process, to the necessity of preserving the specificity of an assessment context, and to the subjective interpretation of the process. All the main quality research schools, critical approaches, so-called “naturalists” techniques or the techniques of the “fourth generation” popular with western specialists fall under this category. The latter as opposed to the first three generations of assessment (namely measuring, description and judgement) imply the use of a constructivist model of the world, according to which the interests of stakeholders are taken into account first of all.

There are endless disputes among the supporters of all the listed groups within the community of specialists dealing with efficiency assessment. All of them prove the efficiency and effectiveness of their approach and reproach their opponents in insolvency.

Obviously, there is no common opinion about what method should be considered the most effective one. However, as it was mentioned above, experienced practitioners are conversant with all the strategies that allows them to use a range of techniques most appropriate for a specific situation. Each of the methods described allows to reveal a separate area of company activity and a set of methods lets us see a comprehensive picture of company activity and the main directions of its development.

The task of radical efficiency improvement is the task of reclassifying the company as the one having the highest level of efficiency. It can be argued that this category is also characterized by full account of systemic properties of the organization. The composition of the objectives of personnel management change with the development of organization and its transition from one category to another. The main object of management of the organizations belonging to the first category is the quantity and quality of labor. New objects of management appear in the second category organizations. They are individual and collective creativity and socio-psychological climate.

![Firm management cycle](image_url)

**Figure 1.** Firm management cycle
The appearance of new management objects demands the development and the implementation of new organizational structures and arrangements. At the same time, the transition of the organization to a new and broader level makes it more difficult to determine its performance indicators correctly because new intertwined variables are introduced. That is why to determine the effectiveness of the organization, one needs a number of specific skills and considerable experience.

**Corporation effectiveness.** The essence of corporate management is the implementation of the cycle of its governing for achieving the maximum effectiveness of functioning which is the main criterion of corporate management. Currently, Western scholars proposal suggests the cycle of firm management consisting of four stages. In particular, Mascon, Albert and Hedory suggest such scheme (Fig. 1).

In our opinion, however, such vision is too limited and is not appropriate for a corporation. Therefore we suggest an extended management cycle containing seven stages (Fig. 2)

We consider that to implement a management cycle, shown in Figure 2, Management Company must determine and coordinate the checklist, the structure and the bulk of information about functioning with subordinate enterprises.

![Figure 2. Corporation management cycle](image)

The list should contain sufficient information to get a comprehensive picture of the situation of the enterprise and should be brief at the same time.

One of the leverages subordinate enterprise executive can be the procedure of distribution of profits from projects to enterprises-participants. Another leverage can be the delegation of authority from corporation to enterprise. A management company determines corporate policy as a hole and the head of enterprise determines the policy of the enterprise according to the general policy and interests.

In its turn a corporation can serve a representative of the enterprises to the state, being a single taxpayer, for instance. Every corporate association has definite operational objectives and it must be managed according to these objectives. The stages of management in compliance with the objectives are shown in Fig. 3.

To manage the efficiency it is necessary to determine what corporation efficiency is and to be able to assess the efficiency of functioning. Corporation is considered to be the association of different commercial structures and to assess its efficiency it is important to estimate the efficiency of member-enterprises. For this purpose we recommend to use a resource indicator, that is common enterprise profitability. To calculate the index of effectiveness the following formula is used:

\[ E = \frac{NP}{GBV}, \]
where $E$ stands for effectiveness of enterprise functioning, $NP$ means Net Profit of the enterprise; $GBV$ is Gross Book Value of the enterprise.

It is also very important to measure the integrated efficiency for the enterprises functioning within a technological chain (TC) as it is the main integral indicator giving the opportunity to estimate if production volumes correspond to planned ones provided that all the resources of technological chain are used. It also allows one to estimate the effectiveness of enterprise cooperation within a technological chain. The integrated efficiency of technological chain functioning demonstrates what integral economic effects have been achieved by using all the assets of the technological chain. To calculate the integrated efficiency of a technological chain (TC) the following formula can be applied:

$$E_{ch} = \frac{NP_{ch}}{GBV_{ch}}$$

where

$$NP_{ch} = \sum_{i=1}^{n} NP_i;$$

$$TS_{ch} = \sum_{i=1}^{n} TS_i;$$

$NP_i$ is net profit of enterprise $i$;
$TS_i$ are total assets of enterprise $i$;
$n$ is the number of enterprises within the chain.

6. Conclusions

Thus, the integrated effectiveness of activity of a technological chain equals the quotient of total net profit and total assets. Comparing the calculated value obtained to the planned one, we can come to the conclusion insofar that the member-enterprises of a technological chain have deviated from the indicators in one direction or another. We would like to point out that every technological chain is a separate production process, so performance indicators are necessary to the managers of enterprises to compare different chains regardless of the quantity of member enterprises and the quantity of operations of technological cycle. The question of efficiency of definite technological chains functioning becomes crucial because the results of separate constituents functioning define the state of the whole corporate system.
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