

The Definition of the Dominant Concept of Organizational Development for Research Organizations in the Applied Engineering Field

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Abstract

The author's view on the problem of change and development of scientific organizations at the present stage was substantiated. It was taken into account the peculiarities of their functioning. The concept of organizational development E and O by Beer & Noria in relation to the specific of research organizations was considered. The methodology was developed and analysis of the appropriateness of the development models of scientific organizations to the concepts of organizational development was done. It demonstrated the prevalence of E-concept characterized by the financial goals priority to achieve the effectiveness.

Keywords: Development model, development concept, scientific organization, development management, change management, efficiency

INTRODUCTION

The relevance of the formation of scientific and methodological bases of scientific organizations management is caused by their increasing role in modern economy of Russia and in the world. Declared by the country's leadership the innovative development of the socio-economic system which has no alternative and determines the requirements to the efficiency and effectiveness of science as the foundation for future innovative technologies and products.

The current structure of the science sector in the Russian Federation is characterized by the most significant role of research organizations, as evidenced by key indicators in 2015, the share of research organizations in the total number of organizations performing research and development is 41%; the share of the personnel of the scientific organizations in the total value of personnel performing research and development is 59%.

Ensuring the competitiveness of research institutions is a national task solved with the use of incentive tools (targeted and competitive funding, privileges and preferences, etc.) and in the framework of particular organizations activity at the local level.

This requires the formation of a complex methodology for the management of scientific organizations on the basis of the

broadcast of key classical and contemporary foundations for specific activities of research organizations.

Obviously, in this case methodological framework of the organizations change and development management which has found its application in the production companies management is very useful [1].

Scientific organizations, especially those which specialize in the engineering field, have to provide their own functioning sufficiently similar to the principles of the partners from the production sector. In addition, the decisive role of science in the modern world increasingly involves research organizations into the system of market relations where there is a rigorous selection of the most competitive organizations (groups) in accordance with the outcome indicators, customer satisfaction, etc. [2]

Contemporary studies of organizations change management justified significant differences between organizational change in various sectors during their practical implementation [3]. In the works of Ferlie et al. [4], Sminia & Nistelrooij [5] specific features of change management in the public sector of the economy were highlighted. It should be taken into account in the case of scientific organizations mostly related to this segment.

The aim of this work is to study the feasibility of implementation of changes and development management system in the practice of research institutions and to identify the dominant development concepts of the modern Russian scientific organizations.

MATERIALS AND METHODS

Change management has been defined as 'the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers' [6]. The result of change management should create the new format for organizational development based on specific target values and indicators.

The necessity of changes planning and the selection of the base development vector (concept) are caused by factual problems noted in the works of Gans [7], Meaney & Pung [8] if changes are organized spontaneously or under incompetent

management [9], [10], [11]. Since the need for change often is unpredictable it tends to be reactive, discontinuous and often triggered by a situation of organizational crisis [12], [13].

The formation of an effective methodology for change and development in scientific organizations is possible on the basic framework of organizational development models. Detailed analysis and systematization of the existing approaches to models organizational development were given by the authors in other work [14] including their synthesis (by area, by response of organizations to the source of the change, according to the source inspiring the change, etc.) and developed by individual researchers for specific purposes types (from the standpoint of the organizations adaptation degree to the requirements of technology and market, depending on key factors, etc.).

In this work the authors focused on two polar concepts of organizational development proposed by Beer & Noria [15] provisionally designated as E and O. E-concept focuses on the financial objectives of the organization, their efficient achievement. O-concept considers the organization as a self-developing system largely focused on corporate goals and culture, the motives of the organization staff.

In accordance with the E-concept the target vector of any organization is to increase profits. The O-concept defines the priorities for the development of organizational capabilities, competencies, human capital over the economic goals that is definitely eventually helps them. So, for organizations engaged a generation or a stream of knowledge the developed intellectual capital is a key source of profit.

The research Price & Chahal [16] is evidenced about the high role of organizational culture for achieving the development goals. It ensures the responsible attitude of personnel towards the change, reduces the resistance to change and ultimately ensures effectiveness of the transformation and further development of the company.

In the work Gravells [17] individual and organizational change are separated. It further points to the need for personality-focused change. If organizational changes do not change specific workers, their competence, the result generally turns out to be low.

Taute & Taute [18] noted the importance of the individual within the subsystems of the organization, for without the individual, there would be no systems, and consequently, no organization.

For ensuring the goals of self-development in the framework of the O-concept involved (participatory) management mainly used. It implies the maximum involvement of the staff in the management process. These methods provide not only the opinions of employees but also serve as a tool of motivation to change and as element of self-organization.

They provide to create a culture of change and innovation which is one the best ways to build organizations that can respond to change in a positive and proactive manner [19].

The E-concept implies autocratic leadership, uses ready solutions and technologies in management, and financial incentives as a motivation to change.

The process of change within the E-concept provides transformation of the "hard" elements (the organizational structure and system) based on clear planning and forecasting the expected results.

In accordance with the O-concept organizational changes represent the majority of reactions to emerging opportunities and are characterized by spontaneity. As a result the change objects are mostly "soft" elements (the organizational culture).

In practice, the models do not exist in "pure" form, and organizational development at different stages of the life cycle of the company represents their combination.

Balestracci [20] goes on to cite the 85/15 rule: 85% of the problems in an organization derive from faulty process while only 15% or fewer are related to employees, and thus, management should take the stance to "blame the process, not the person". This further demonstrate the need for changes in the organization proven in the key the vectors as E-concepts and O-concept.

The identification of characteristics and factors of classification allows to correct the development vector in a side of multi-polarity and complexity and to take proactive measures in those basis direction which are mostly needed in change at the moment.

The object of study in this article are research organization mainly in the field of applied engineering. Obviously, the specific characteristics of their activities determine the priority of the development concept.

At the present stage their development may occur at different model and trajectories while for each of them the closest model in a number of characteristics and features can be determined.

Considering E-concept and O-concept it is noted that in the current conditions of reducing the budgetary funding of science which placed scientific organizations in the context of the need to search for additional sources of funds, the use of E-concept as the basis is required. At the same time, due to the specific nature of the activities of scientific organizations (the generation of new knowledge and their dissemination) as well as the creative nature of such activity O-concept can be considered as more preferable for such structures.

Scientific organizations create a special product - scientific and technical products and services which value is in their uniqueness, high quality and strict compliance with the task or solved problem. In this regard, solely financial incentives and economic goals can deform the basic principles of

development, namely, due to the need to quickly achieve financial results, the quality, depth of problems study is reduced, the practical value of the results obtained is lost is decreased, etc. [21].

Development based solely on self-organization of scientists, their intrinsic motivation, on the interest to the solved problem, on the satisfaction of needs in scientific research are not able to fully create the conditions for the efficiency and effectiveness of scientific organizations in general because, in some cases, there is a substitution of priorities: the scientific process comes to the fore compared to the result. Funding of both public and commercial sector of science aims at the creation of fundamentally new products and technologies that can become the basis for the development of economy and social sphere. Therefore a clear motivation of individual researchers and scientific organizations generally for the result with financial basis is an important prerequisite to the realization of its mission and accomplish tasks.

Thus, to use as a development basic O-concept or E-concept in pure form is not appropriate for research organizations. For the various structures the optimal combination of the above concepts including both financial and non-financial incentives must be designed.

For determining the priorities of scientific organizations development as criteria basis in accordance with O-concept and E-concept as quantitative indicators and qualitative criteria can be used. Obviously, in this case, a qualitative evaluation can give definitely better results, however, it involves significant effort and requires the use of a wide range of information sources, and field research, questionnaire and interviewing staff, etc.

Evaluation based solely on quantitative indicators is a more conditional but allows to identify reference points of scientific organizations development in accordance with the criteria of O-concept and E-concept. The following are indicators selected from among the data of the Federal system of monitoring of effectiveness of scientific organizations performing research, developmental and technological works (FSME) which can serve as criteria of a particular model of development (table).

Table 1: The System of indicators characterizing O-concept and E-concept for research institutions

E-concept	O-concept
The financial performance of scientific organizations (volume of performed works and services)	The number of graduate students and doctoral candidates
The total income of small innovative enterprises	A number of researchers ordered to work in leading Russian and international scientific and educational
Internal current expenses	

for research and development	organization
Costs of remuneration of employees engaged in research and development	The number of defended thesis
	The number of foreign scientists working in research organizations
	The number of scientific conferences with international participation, organized by the organization
	The number of positive and neutral mentions of the organization in the media at the federal level

To identify key vectors of development in accordance with its essential characteristics their dynamics have to be investigated, first of all, those indicators that were the most significant have to be identified. Obviously, in some cases, it may be caused by the action of random factors but the presence of significant changes in several characteristics of the group allows to assert the priority of one of the development concepts (E or O) with high probability.

Basic tools for study is the mathematical statistics that have the arsenal of techniques which allows to provide the most accurate results based on the processing of large data sets.

RESULTS

In the framework of the present study for the analysis of compliance of scientific organizations to the organizational development concepts by Beer & Noria the data from reports of FSME for 2013-2015 was used.

From all of the organizations according to the criterion of the main organization activities – "scientific research institutes" the sample of 860 organizations were formed.

The methodological basis of the concept analysis is the calculation of integrated indicators as the sum of the growth rates of the concepts variables referred to the number of indicators:

$$T_{np} = \frac{X_t - X_{t-1}}{X_{t-1}}$$

$$I = \frac{\sum_1^n T_{np,j}}{n}$$

T_{np} – growth rate, X_t и X_{t-1} – the value of the indicators in the current and previous year, n – number of indicators, I – integrated indicator.

To clean the dataset and to exclude emissions due to possible inaccuracies in the source data the criterion based on quartile scope was used (IQR):

$$IQR = Q_3 - Q_1$$

где Q_1 – lower quartile, Q_3 - upper quartile.

Values that are extreme outliers were excluded from the analysis in accordance with the following criteria:

$$\begin{cases} X < (Q_1 - 3 * IQR) \\ X > (Q_3 + 3 * IQR) \end{cases}$$

The maximum and minimum values were recorded as 1 and -1 since the analysis is carried out for relative performance.

As the result of the study matrix of dot charts in the coordinates of the integral indices of E-concept and O-concept was designed. The each point corresponds to a specific scientific organizations from the sample (Fig. 1,2).

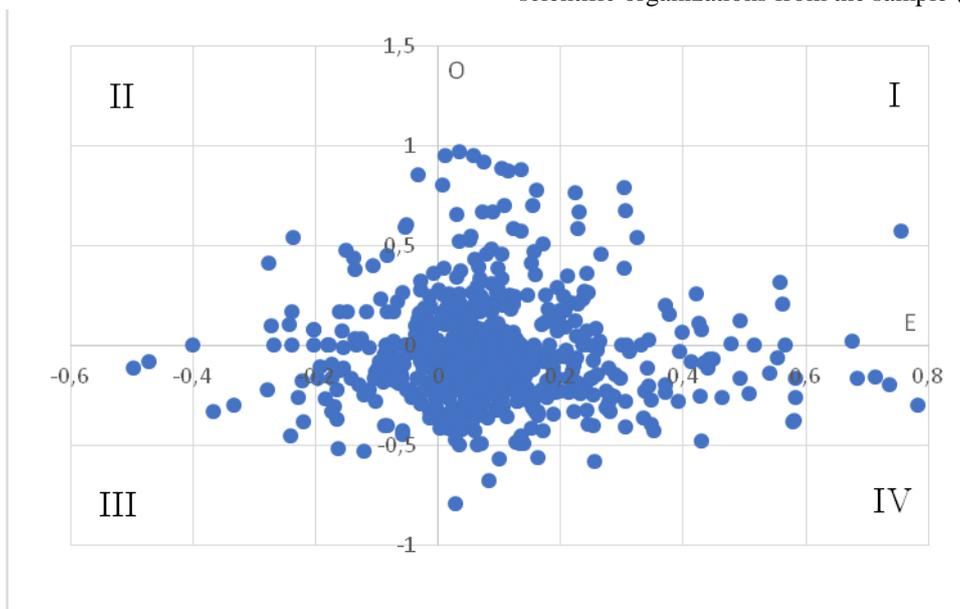


Figure 1: Matrix of scientific organizations corresponding to E-concept and O-concept in 2014

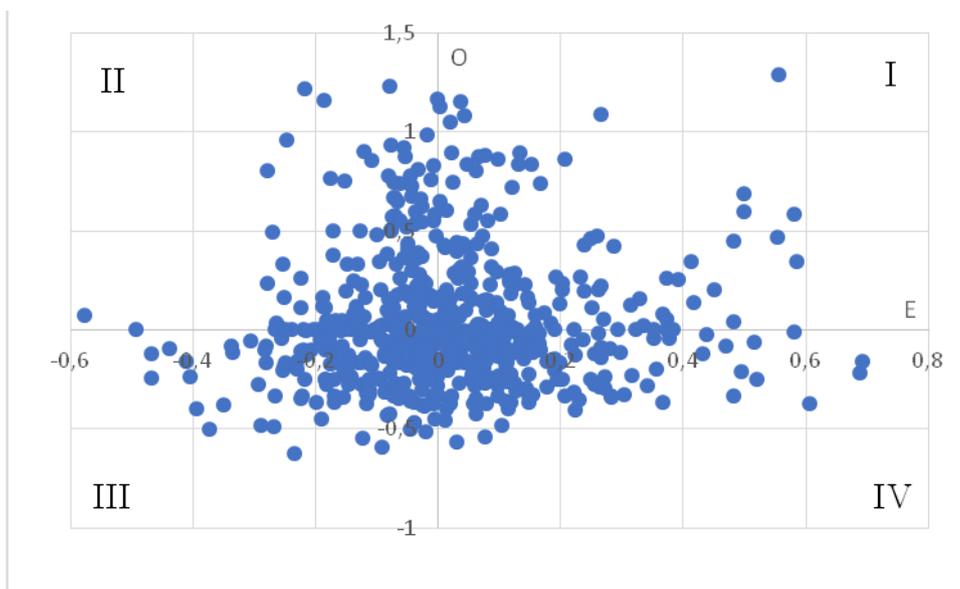


Figure 1: Matrix of scientific organizations corresponding to E-concept and O-concept in 2015

The structure of scientific organizations related to different combinations of integral parameters of the concepts presented in table 2.

Table 2: The Structure of scientific organizations related to different combinations of integral parameters of E-concept and O-concept

Quadrant	Condition	2013-2014	2014-2015
I	$E \geq 0, O \geq 0$	29,5%	22,5%
II	$E < 0, O \geq 0$	10,3%	23,7%
III	$E < 0, O < 0$	13,1%	28,2%
IV	$E \geq 0, O < 0$	47,1%	25,5%

It should be noted that in the period 2013-2014 distribution of organizations in the axes of the integral indicators of E-concept and O-concept biased in the fourth quadrant, and in 2014-2015 the distribution is more uniform and less concentrated in the center.

DISCUSSION

In the period 2014 in the research organizations the E-concept is the prevailing (76.6% of organizations have an integral indicator E is greater than O). In 2015 the number of such organizations is dramatically reduced and becomes less than half (48.0%), probably, due to the financial crisis and a decrease in the overall revenues of the organizations. The greatest influence on the decrease in the average integral indicator having a smaller increase of the costs of remuneration of employees engaged in research and development. If in 2014 it stood at 13.6% in the following period it is only 2%. Other components were also reduced. Thus, the average increase in the internal current expenditure on research and development decreased from 10.8% to 1.9%; financial performance of scientific organizations - from 9.3% to 1.7%, the total income of small innovative enterprises increased the reducing from -0.2% to -0.7%.

In the 2014 a positive value of the integral indicator for the O-concept period is typical for 39.7% of the organizations. In the 2015 the number of such organizations increased to 46.2%. The gain provided by all the components of the integral indicator with the exception of a number of scientific conferences with international participation (has negative growth is 3.5% in 2014, -6,0% in 2015). The greatest contribution has ensured the growth of "the number of defended thesis" (average value increased from -19,7% to 4.1%), "the number of foreign scientists working in research organizations" (-6,2% to 2.3%), "the number of researchers ordered to work in leading Russian and international scientific

and scientific-educational organizations" (from -7,8% to 0.5%).

The number of organizations with a positive growth in financial performance has declined from 69.8% to 42,0%; internal current expenditures on research and development from 77,0% to 45,0%; the costs of employees engaged in research and development with 76.0 % to 48.6%.

Empirical estimates which are the result of the analysis and are average and generalized. In accordance with studies Hughes [22] at the practical level the changes are not as in theory. The key issue of change management in research institutions remains in the field of the selection of specific methods to achieve the prescribed development performance indicators.

In addition, the prevalence of financial development vector of research organizations causes fear since organizational culture and human capital according to some researchers [23], [16] is the basis for effective change and development.

Success of organization is fundamentally linked to how well they maximize the effectiveness of their people [24].

CONCLUSION

Summarizing the results of the analysis, it is noted that the priorities of national scientific organizations of the public sector are largely in the field of the achievement of high financial performance due to requirements of state policy and market because of funding is mostly allocated on a competitive basis. The prevalence of E-concept in the development of scientific organizations can facilitate the development of deformities in their social roles of generator and translator of excellence because the achievement of significant scientific results can occur abruptly and does not depend on the criteria and indicators.

ACKNOWLEDGEMENTS

The article is the result of the research funded by the Ministry of Education and Science of the Russian Federation within the research project "Change and Development Management of Scientific Organizations in the Context of the State Policy of their Restructuring" implemented by Tver State University.

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