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Study of the organization adaptivity rate correlation in relation to its internal integrity

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ABSTRACT

The focus of modern project management is increasingly shifting from the management of individual projects to the management of strategic project-oriented development of organizations. Now there is a need to pay more attention to project management as a universal tool for the development of systems at any level. The aim of the article is to study the processes of organization adaptation to constant changes through a synergetic portfolio of projects based on a strategic plan for the development and evolution of the organization. The spiral movement of systems development for studying development processes is considered: the process of transition of an organization from one stable state to another, the process of radical changes that accompanies innovation, as well as the processes of growth and development of crisis phenomena. The methodological principles of the organization evolutionary development management through the implementation of portfolio using its methods and tools are considered. It is proposed to manage the organization evolutionary development by building actions in the form of a synergistic portfolio of appropriate projects content, in order to increase the value of the entire portfolio of projects over the value of individual projects. The synergetic portfolio of projects is seen as a tool for a harmonious transition to the desired evolutionary state, by preserving the internal integrity of the organization and ensuring its sustainability. A mathematical model for estimating the desired properties and relations of the organizational synergetic portfolio of projects is proposed, which allows to determine and minimize the magnitude of the evolutionary goals inconsistency and to stabilize the current state of organization. It is determined that the two main tasks of any organization - external adaptation and internal integration - constantly push the organization to evolutionary development. The article proposes the author's approach to managing the organization evolutionary development through a portfolio of projects identifies indicators of adaptation of the organization to changes in the environment, defines the conditions for maintaining the integrity of the organization in the process of organizational changes.

Keywords: project portfolio; organization adaptability; organization evolution; organization adaptation; external conditions; synergetic management

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INTRODUCTION

Leaders of organizations implement innovative projects, portfolios and programs, confident that these actions will provide long-term prospects and further strategic development of the company in the future. They see their further success in the market in increasing profits, gaining new markets, launching new products or more. However, as a rule, these actions take place separately from the strategic plan of the organization, and in most cases, this plan is simply "adjusted" to the market situation and, thus, adapt the strategy to the actual state of projects, programs or entire portfolios. Moreover, this is at best. More often than not, a development plan and / or strategic plan is a "dead" document that exists but does not work. Although it is clear that the strategy should determine the projects, portfolios and programs which need to be implemented, and not vice versa.

In the process of evolution, any organization faces certain problems and challenges that bring chaos to its activities and behaviour [1]. The effectiveness of the organization is determined by a well-chosen strategy in accordance with the conditions of a dynamic environment or its reorientation, if necessary, in accordance with the changes that affect. The main essence of management is to coordinate the organization development strategy with the implementation of project-oriented activities. Therefore, at the level of project-oriented activities it is very important to make a reasonable selection of projects, programs and portfolios that meet the strategic goals of the organization.

The object of research is the process of ensuring the viability of organizations as a system, in the process of evolution, reducing destructive factors, creating conditions for effective adaptation and harmonious transition to the best level of development – the heyday phase of the organization life cycle.

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The subject of research is the managing methods and principles of the adaptive capabilities of the synergetic projects portfolio.

1. ANALYSIS OF LITERATURE DATA AND PROBLEM STATEMENT

Project-oriented development of organizations considers the restructuring of project management at three levels: project portfolio, program and individual projects. Defined strategic goals and objectives should be translated into the level of project, program or portfolio management to ensure that the implemented innovations will achieve the set strategic goals and solve the problems that have arisen.

Any organization is constantly pushed to change by two main requirements of its viability – external adaptation and internal integration. The success of these processes is ensured on the basis of knowledge of the laws of construction of actions for the development of the system in the form of a synergetic portfolio of projects. The synergetic portfolio of projects includes projects, portfolios and programs [2] and therefore in the future we will use this term, summarizing the all project activities. Because the portfolio covers the entire activities of the organization and may change due to changing strategic goals, portfolio managers constantly scan for changes in the organization's environment and monitor overall indicators of the organization's development.

It is the strategy that is the driving force that leads to changes in the organization maturity, in the context of the organization life cycle: its growth, aging or dying [3-6; 7, p.18-21]. Otherwise, there is an imbalance of the organization system and the organization does not achieve the desired results, and in extreme cases, and "die". The strategy should be formed as a plan for responding to the future "crisis" in order to pass it constructively and with the least losses.

Balanced development of the organization through project management is impossible without the coordination of evolution, i.e. the phase of development in which the organization is (or rather approaching the bifurcation point of the life cycle of organizational development) with the development strategy of this organization.

There is no doubt that the chosen strategy (through the introduction of innovations and those in turn through a synergistic portfolio of projects) undoubtedly affects its evolution, i.e. change the phases of the life cycle of the organization. The organization can achieve in its evolution the most desirable phase of prosperity by implementing an effective development strategy and, in principle, will be in this state for a long time, fulfilling the conditions of external adaptation and internal integration.

The more the strategy corresponds to the existing or desired phase of the life cycle of the organization to which the transition is made, the higher the predictability of the further dynamics of the process and the adaptability of the organization. That is, it is necessary to understand how the choice of strategy affects the organization and relates it to a particular phase (as feedback on the feasibility).

However, not knowing "where the organization is" it is difficult to plan and manage the process of its strategic development, that is, it is unclear "where to go to the organization" as a result of a strategy.

The concepts of systemicity and self-organization, which are developing today at all levels of knowledge of reality, mean that the phenomena of development in general can be considered as a struggle of two opposite tendencies – organization and disorganization [8]. Insofar as the level of the organization growth as for any system has its limit, area of saturation or its optimum; which is determined by the target function and opportunities for further development.

The basics of project portfolio management are laid down in the standards of modern project management methodology PMBoK (Project Management Body of Knowledge) [9-10] and National Competence Baseline (NCB Version 4.0) [11-12]. In the 7-th version of the PMBoK, announced for release in 2021, management recommendations have shifted from process management to management principles, among which one of the key ones is adaptability and sustainability [13].

The principle of synthesis underlies the development of any organization, since it is determined by factors of the external and internal environment. The two main tasks of any organization – external adaptation and internal integration are reflected in the model of movement of the organization through the phases of the life cycle.

The most famous studies of an organization life cycle are the models of I. Adizes, L. Greiner, J. Kimberly, J. Parnell, D. Miller, P. Friesen, L. Lester, S. Hanks and others. The results of the analysis of these models by other researchers indicate that [3-7; 14] that, despite the differences in the number of phases, they all describe similar life cycles.

The concept of dialectics about the spiral movement of systems [15-16], especially the law of negation, is very important for the study of development processes. We can consider the

development of the system as a transition along the turns of a spiral, each of which follows from the previous one [17]. The image of the development spiral arose as a dialectical negation and synthesis of two metaphysical images of the development process: the image of progressive movement along a gentle straight line and the image of movement in a circle between two extremes from extreme egoism to extreme altruism, passing at the same time the peaks of maximum order and maximum chaos (entropy) [18].

In practice, the inertia of material systems leads to a spiral trajectory of motion, since an abrupt change in the system development direction is impossible (Fig. 1).

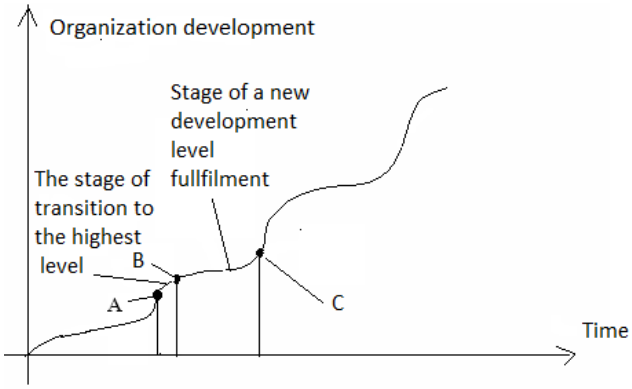


Fig. 1. **Model of the organization transition on life cycle phases**
Source: **compiled by the author**

The development of many processes in the economy, including organizations, is carried out in accordance with the S-shaped curve, which represents the dependence of certain system parameters in time. The mathematical apparatus of S-shaped curves describing various aspects of systems development is used in the models of L. Raidenur, J. Holton, R. Perl and many others [20-21]. This generalized model has been repeatedly applied both in foreign and domestic practice, demonstrating quite satisfactory results. With the help of the S-shaped curve (Fig. 1) the process of transition of an organization from one stable state to another the process of radical changes accompanying innovation, as well as the processes of growth and development of crisis phenomena are modelled [22].

The hypothesis of the study that needs to be tested is that the destructive force of the viability of holistic organization, as a system in the evolution process, is not the time factor itself, but the action of external and internal forces on the organization over a period and failed adaptation, as a gardening of internal integration, can be adjusted by quantifying the energy of the system and implementing appropriate management actions to neutralize or reduce destructive factors.

2. PURPOSE AND OBJECTIVES OF THE RESEARCH

The aim of the article is to study the processes of adaptation to change through a synergetic portfolio of projects based on a strategic plan for the development and evolution of the organization.

Based on the formed purpose it is possible to allocate the following tasks of research:

1. Investigate the methodological principles of the organization evolutionary development managing through the implementation of portfolio management, to determine the factors influencing the viability and destruction.

2. Develop a mathematical model for determining the state of the organization stability as a holistic organizational and technical system.

3. Develop and test a mathematical model for determining the adaptive capabilities of the synergetic portfolio of the organization.

3. MATERIALS AND METHODS OF RESEARCH

When writing the article, the method of comparison, the method of analogies, the method of analysis and synthesis, the method of extrapolation, as well as tabular and graphical methods of presenting information were used. Statistics of activity of the commercial organization of LLC “Dniproregionbud” were used for approbation of scientific researches.

4. RESEARCH RESULTS

Adaptation in a broad sense is understood as a separate type of management, in particular, flexible innovative management of the organization, which is able to adapt to new conditions in the external environment through projects and programs [23-24]. In the light of the theory of evolutionary dynamics of values, development is not a jump of the organization to the highest level, but the creation of conditions for a harmonious transition to the next level. The natural evolutionary cycle underlies the transitions from one dominant value to another within the organic development of the organization [25-26]. However, evolution can be accelerated by appropriately influencing transients. The success of transition processes is ensured on the basis of knowledge of the laws of evolution, the construction of a system of actions in the form of a portfolio of projects of appropriate content. It is obvious that in the case of adaptive development, socio-cultural factors (soft components), with the action of which professional project management is connected,

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acquire increasing importance.

The aspect of maintaining the internal integrity of the organization, although it can be partially determined by a number of relevant indicators, it is difficult to fully describe and take into account the many consequences. The result of the dialectical synthesis of external adaptation and internal integration of the organization should be a synergistic effect, when the value of the entire portfolio of projects exceeds the value of the implementation of individual projects. Portfolio management itself is a tool that allows planning actions that are clear to all performers, so that the vision of the future of the organization becomes a reality.

The processes underlying the modelling of the external environment include decomposition and synthesis, for which they represent hierarchies and priorities. At the same time, it is necessary to maintain a balance between simplicity and the need to generate a scientifically sound solution. The difficulty lies in the multicriteria of real tasks; defined not only by many goals, but also by the fact that one goal can rarely be represented by one criterion. The solution to this problem is to find several criteria that describe one goal in different ways, complementing each other, among which may be technical, financial, commercial, environmental, social, economic, structural and organizational indicators.

The current management of the organization evolutionary development can be done through the implementation of the projects portfolio management using its methods, techniques and tools. The main stages of projects portfolio management can be formalized by placing information in a repository or retrieving it from the repository upon request. Assume that a tuple of desired properties is specified for the organization in quantitative or qualitative scales.

$$P^d = \left\langle P_1^d, ... P_n^d \right\rangle . \quad (1)$$

By definition, any property of an abstract system is realized only on a certain structure S, which is a set of elements E ordered by relations R:

$$S = \left\langle E, R \right\rangle . \quad (2)$$

We believe that as a result of studying natural systems are known the reflections:

$$\begin{aligned} P^d &\to E : E^S \\ P^d &\to R : R^S \end{aligned}, \quad (3)$$

where: E and R – respectively, sets of elements and relations; E^S, R^S – subsets of elements and relations, which in principle can be implemented properties P^d that determine the area of its existence.

In real conditions E^S, R^S, some restrictions are imposed, which narrow the scope of existence to an acceptable area $E^d \subset E^S; R^d \subset R^S$. On these subsets, we can synthesize many structures C^{Sd}, not all of which can be practically implemented.

Therefore, we select a subset of structures C^d that can be practically implemented and obtain a set of desired properties of P^d:

$$C^{Sd} \supset C^d = \left\langle E^d, R^d \right\rangle . \quad (4)$$

The quantitative level of realization of specific properties is determined by the quantitative values of the characteristics of the elements E and the intensity of the relations R within a fixed structure C^d.

Since the portfolio, like the organization in general, is a dynamic system, this means that the quantitative characteristics of the elements that make up the system and the intensity of the relationship change over time, i.e. (4) takes the form:

$$C^d(t) = \left\langle E^d(t), R^d(t) \right\rangle . \quad (5)$$

Thus, the properties of the system also change over time, ie each current state of the portfolio structure corresponds to the actual current values of the properties

$$P^F(t) = F\left[C(t)\right]. \quad (6)$$

Comparison of P^F (t) with the target P^d (t) allows us to determine the amount of inconsistency:

$$\Delta P(T) = P^d(t) - P^F(t) . \quad (7)$$

Minimizing this inconsistency is the task of ongoing project portfolio management. It is not initially known whether deviation (7) is a random variation or a long-term trend. To conduct interval analysis, the concept of planned interval T is introduced.

Then:

$$\Delta P(T) = \int_0^T \left[P^d(t) - P^F(t)\right] dt, \quad (8)$$

where P^d(t) – current target values that ensure the achievement of the target state P^d(T).

With this in mind, the following problem situations are possible:

$$\begin{aligned} &\Delta P(t) > \Delta^+ P(T), \\ &\Delta P^-(T) \le \Delta P(T) \le \Delta^+ P(T), \\ &\Delta P(T) < \Delta^- P(T), \end{aligned} \quad (9)$$

where $\Delta^+ P(T), \Delta^- P(T)$ – the value of the tuple of indicators that determine the zone of their insensitivity.

Situations (9) are, respectively, states of advanced development, stability and stagnation of

the organization. Therefore, the sustainability of the organization can be defined as the ability to achieve goals at a given time interval under conditions of random environmental disturbances that are interval in nature.

By definition (1) P is a tuple of heterogeneous indicators that have different content, dimension, direction of dominance, measurement scales and in general contradictory. In this regard, for a constructive analysis of the portfolio and the organization in general, to assess the dynamics of development there is a need to form a system of generalized scalar, situation-oriented indicators. The latter means that each level of analysis of the problem situation corresponds to an aggregate set of assessments that take into account both individual indicators (properties) and their various groups, up to a complete set. This set of indicators is the basis for identifying the state of the organization and acts, firstly, as a set of performance indicators, and secondly, as a set of optimization target functions in solving problems of managing the development of the organization and implementation of adaptation.

The problem of development management is not trivial and has two aspects:

– theoretical and methodological, related to solving problems of multifactor evaluation and multicriteria optimization;

– organizational, which requires standardization of these indicators, as only in this case you can build a holistic hierarchy of aggregate models and obtain constructive absolute and relative assessments of the state of the organization.

Building a conceptual model of the organizations development managing in a changing environment aims to identify alternative strategies and many development trajectories, in the implementation of which the organizational and technical system achieves the desired state under the influence of effective adaptation.

At first, to determine the phase of the organization development, the state of the organizational system is assessing based on statistical data.

As a rule, the following three types of information act as statistical support:

1. Macroeconomic information, which is ancillary information and has a general economic nature.

2. Microeconomic information about the state of the organization and its elements used as a basis for calculating the necessary indicators in modelling development.

3. Qualitative information about the priorities of the organizational system based on the evolutionary theory of values.

Technical and organizational system in the classical sense has an internal fundamental property – the integrity of the system. The transition to a new level of values is accompanied by the appearance in the system of new characteristics that were not previously inherent in its elements.

It is known that over time, systems are subject to decay, loss of integrity. The destructive force is not the time factor itself, but the action of external and internal forces on the system over a period of time and unsuccessful adaptation. Let us consider the conditions for the development of organizational system in terms of energy approach.

Bazhyn I. [27] to assess the viability of economic systems identified factors influencing its internal integrity:

– kinetic energy (to describe intangible objects in economic [27] and philosophical sciences [28] use the same concept of “energy of motion”);

– energy of internal connections of the system;

– medium pressure energy.

Two main conditions for the destruction of integral systems:

1. The system will be destroyed if the internal sources are not able to support the development of the system, ie the total energy of the system will exceed the energy of its internal connections. This condition is because the internal forces are not able to support the development of the system and thus, internal integration has not been carried out to the extent necessary.

2. The system will cease to exist if the pressure of the medium exceeds the resistance of the system itself, ie the energy of internal connections is less than the total energy of external actions, and thus the external adaptation of the organization was not carried out to the extent necessary.

These conditions 1 and 2 can be formalized in the form of the following inequalities:

$$\sum_i E_i^{kinet} > E^{\text{int}}, \qquad (10)$$

$$\sum_j E_j^{ext} > E^{\text{int}}. \qquad (11)$$

where: E_i^{kinet} – kinetic energy in the i-th direction of development, $\sum_i E_i^{kinet} = E^{kinet}$;

E^{int} – energy of internal connections of the system;

E_j^{ext} – energy of the j-th external action on the system, $\sum_j E_j^{ext} = E^{ext}$.

The use of conditions (10-11) will be valid if the quantitative measurements of energy are comparable in scale. Since it is impossible to achieve this in dynamic conditions, it is necessary to

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compare relative (normalized) values.

In addition, although these conditions exist independently of each other, and to ensure the existence and development of the system it is necessary to take them into account at the same time, so these conditions must be made a condition for ensuring the viability of the system:

$$E^{ext} + E^{kinet} < E^{\text{int}}. \quad (12)$$

Condition (12) means that the energy of internal connections must be spent on resisting the influence of the energy of the external environment and the energy of motion.

To ensure viability, it is necessary that the conditions (10-11) be as follows:

$$\frac{E^{ext}}{E^{kinet}} > 1, \quad (13)$$

$$\frac{E^{\text{int}}}{E^{ext}} > 1. \quad (14)$$

Because energy has no vector orientation, but is a scalar quantity, we divide the right and left parts of inequality (12) into E^{ext}:

$$\frac{E^{ext}}{E^{\text{int}}} + \frac{E^{kinet}}{E^{\text{int}}} > 1, \quad (15)$$

From this condition, it is seen that the energies of the external environment and the energy of motion are interrelated, so we introduce the notation:

$$k^{kinet} = \frac{E^{\text{int}}}{E^{kinet}}, \quad (16)$$

$$k^{ext} = \frac{E^{\text{int}}}{E^{ext}}, \quad (17)$$

Given the above notation, inequalities (16) and (17) take the following form:

$$k^{kinet} > 1, \quad (18)$$

$$k^{ext} > 1. \quad (19)$$

In addition, given the notation, we reduce inequality (16) to the form:

$$\frac{1}{k^{ext}} + \frac{1}{k^{kinet}} < 1, \quad (20)$$

Convert inequality (20):

$$\frac{1}{k^{kinet}} < 1 - \frac{1}{k^{ext}}.$$

Based on condition (15):

$$1 - \frac{1}{k^{ext}} > 0.$$

We can express k^{kinet}:

$$k^{kinet} > \frac{1}{1 - \frac{1}{k^{ext}}}, \quad (21)$$

Solve inequality (21):

$$k^{kinet} > \frac{k^{ext}}{k^{ext} - 1}, \quad k^{kinet} > 1 + \frac{2}{k^{ext} - 1}. \quad (22)$$

In such a rank, it is obvious that the organization system can see three zones (Fig. 2):

1. *The first zone* of living is an area, where the system can stand up to the total impact of motion energy and the environment destruction energy and effectively quickly adapt to it.

2. *The second zone* of ruination is an area, where the system is capable of protecting from each energy separately, however the combined influence of both energies on it is critical and leads to its destruction, because adaptation does not occur or does not occur effectively.

3. *The third zone* of the non-viability is an area, when conditions (18), (19) are not fulfilled.

Implementation of the organization development portfolio releases the energy of the organizational system, as well as strengthens the energy of internal relations, which can further stimulate the development of the organizational system and increase its competitiveness, promote globalization. Thus, the task of portfolio management development should be to obtain a compromise between external adaptation and internal integration of the organization as a system.

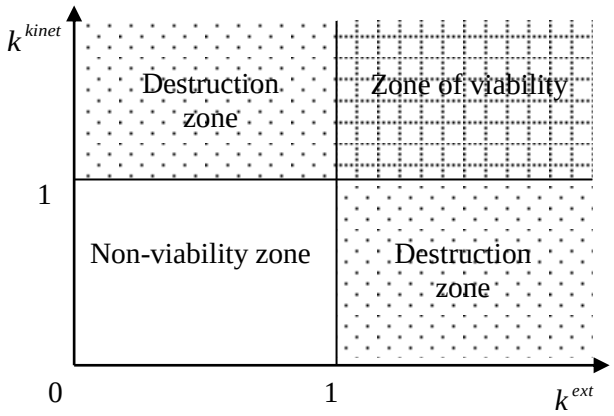


Fig. 2. **Zones of possible states of viability of the organization**
Source: **compiled by the author**

For practical use of conditions (18), (19) it is necessary to be able to find a quantitative estimation of system energy. The currency may be used as a universal economic unit to measure the absolute value of this energy.

5. RESEARCH RESULTS

In order to analyse the state and adaptive capabilities of the synergetic development portfolio, we will consider the relevant performance indicators of the commercial organization LLC "Dniproregionbud" (Dnipro, Ukraine) for 2019.

When studying the stability of a commercial organization or technical-organizational system, it is necessary to take into account not the static state at a particular time t_n, but the dynamic state (at a certain period of time $t_n - t_0$, or in the future at a time t_{n+m}). Therefore, when calculating the criteria of the relevant time period, we will use the method of extrapolation, which is based on the assumption of the continuation of existing trends, ie is to study the trend in the presence of retrospective data (in our case for a year). The method of extrapolation as a trend line can use elementary mathematical functions: linear, quadratic, hyperbolic and others.

The study used a linear function (23):

$$A(t) = y = a + bt, \tag{23}$$

where: y is the sales volume of new products;
t – period number (ordinal number of the month, quarter);
a – point of intersection with the y-axis on the graph (minimum level);
b – value by which the next value of the time series increases;
$A(t)$ – growth rate of sales of new products from the project portfolio.

Then the free term of formula (a) and the coefficient of tilt of the line (b) take the form (24):

$$a = \frac{\sum y - b\left(\sum t\right)}{n}, \qquad b = \frac{n\left(\sum ty\right) - \left(\sum t\right)\left(\sum y\right)}{n\left(\sum t^2\right) - \left(\sum t\right)^2}, \tag{24}$$

where: y is a variable; t – period number; n – number of periods.

Consider the relevant performance indicators of the organization, which characterize its adaptation to changes in the environment.

As the speed of adaptation processes, which shows how the organization adapts to changes in the external environment, we will use the growth rate of sales of new products from the project portfolio.

Thus, we have integrating formula (24), where the speed of the organization adaptation process (V_A) can be calculated as (25):

$$V_A = \lim_{\triangle t \to 0} \frac{\triangle A(t)}{\triangle t} = \frac{dA(t)}{dt} = b_A = \frac{n\left(\sum_1^n y_A \cdot t\right) - \left(\sum_1^n t\right) \cdot \left(\sum_1^n y_A\right)}{n\left(\sum_1^n t^2\right) - \left(\sum_1^n t\right)^2}, \tag{25}$$

where: V_A – speed of adaptation processes of the organization;
$dA(t)$ – change of the organization adaptation processes;
dt – time increment (period of time for which changes are recorded).
y_A – sales volume (sales growth indicator) of new products from the project portfolio, thousand UAH;
t – period number.

Data for calculations are given in Table1.

Table 1. **Data to calculate the speed of the organization adaptation to the environment**

t	t^2	Quarter	y_A,	$y_A \cdot t$
1	1	March	188	188
2	4	June	248	496
3	9	September	210	630
4	16	December	223	892
TOTAL				
10	30	–	896	2206

Source: **compiled by the author**

We calculated the speed of the adaptation process for the commercial organization of LLC "Dnipro-regionbud" in accordance with the data given in Table 1:

$$V_A = \frac{4 \cdot 2206 - 10 \cdot 869}{4 \cdot 30 - 10^2} = 6,7.$$

The next step is to calculate the rate of V_C changes that occur in the external environment and in their own environment (internal environment) and within themselves (28). The speed of the change process (V_C) researchers [29] identify with the criterion of "controllability", which reflects the degree of controllability and stability of the system main parameters in transition periods.

As an indicator of changes in the B_C system, we will use the percentage of sales of new and old products.

Integrating formula (24), the speed of the change process in the organization (V_C) can be calculated as (26):

$$V_C = \frac{dC(\mathrm{t})}{dt} = \frac{n\left(\sum_1^n y_C \cdot t\right) - \left(\sum_1^n t\right) \cdot \left(\sum_1^n y_C\right)}{n\left(\sum_1^n t^2\right) - \left(\sum_1^n t\right)^2}, \tag{26}$$

where: V_C – speed of the organization adaption process;
$dC(t)$ – change of the organization adaption process;
y_C – sales ratio of new and old products, %.

Table 2 provides all necessary data for calculations.

Let us calculate the speed of the change

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process for the commercial organization of LLC "Dniproregion-bud" in accordance with the data given in Table 2:

$$V_C = \frac{4 \cdot 147 - 10 \cdot 55}{4 \cdot 30 - 10^2} = 1,9.$$

Table 2. **Data to calculate the speed of the change process in the organization**

t	t^2	Quarter	y_C,	$y_C \cdot t$
1	1	March	12	12
2	4	June	12	24
3	9	September	13	39
4	16	December	18	72
TOTAL				
10	30	–	55	147

Source: **compiled by the author**

The rate of destruction of an organization (or, as noted in some sources of destruction) shows the rate of destruction of ties in the system. The destruction process shows how the system reduces its complexity. E.M. Korotkov explains [30, p.107], that usually the change in complexity in the natural sciences is measured by the value of entropy. In the source [31] the authors specify that entropy shows the level of uncertainty of changes in the state of the system in the future with a decreasing in its level of complexity (destruction of business units) [29]. Entropy is defined as a measure of degradation, disorganization of any system [27; 32]. The optimal, according to E.A. Sedov [33], the ratio of determination and freedom (entropy) in the system is 80%:20 %.

As an indicator of destruction (V_R) we will use the dynamics of debt to suppliers.

Taking into account the formula (24), the speed of the organization destruction process (V_R) can be calculated by the formula (27):

$$V_R = \frac{dR(t)}{dt} = \frac{n\left(\sum_1^n y_R \cdot t\right) - \left(\sum_1^n t\right) \cdot \left(\sum_1^n y_R\right)}{n\left(\sum_1^n t^2\right) - \left(\sum_1^n t\right)^2}, \quad (27)$$

where: V_R – speed of the organization destruction process;

dR(t) – change of the organization destruction process;

y_R – amount of debt to suppliers, thousand UAH.

Table 3 provides all necessary data for calculations.

Let us calculate the speed of the destruction process of the commercial organization LLC "Dniproregionbud" in accordance with the data in Table 3:

$$V_R = \frac{4 \cdot 193 - 10 \cdot 69}{4 \cdot 30 - 10^2} = 4,1.$$

Table 3. **Data to calculate the speed of the organization destruction**

t	t^2	Quarter	y_R,	$y_R \cdot t$
1	1	March	12	12
2	4	June	15	30
3	9	September	17	51
4	16	December	25	100
TOTAL				
10	30	–	69	193

Source: **compiled by the author**

The next step is to calculate the rate of complexity of the organization V_S, which describes the process of synergism (32):

The process of synergy formation reflects how the system increases its complexity [30, p.107] and effectiveness in the effective interaction of its elements [29]. As an indicator of the complexity of the organization (*Vs*) we will use the cost of portfolio management.

Taking into account the formula (24), the speed of the process of complicating the organization system (V_S) is obtained in the form (28):

$$V_S = \frac{dS(t)}{dt} = \frac{n\left(\sum_1^n y_S \cdot t\right) - \left(\sum_1^n t\right) \cdot \left(\sum_1^n y_S\right)}{n\left(\sum_1^n t^2\right) - \left(\sum_1^n t\right)^2}, \quad (28)$$

where: *Vs* – speed of the process of complicating the organization system;

dS(t) – change of the process of complicating the organization system;

y_S – portfolio management costs, thousand UAH.

Table 4 provides the necessary data for calculations.

Table 4. **Data for calculating the rate of organization complexity growth**

t	t^2	Quarter	y_S,	$y_S \cdot t$
1	1	March	15	15
2	4	June	22	44
3	9	September	35	105
4	16	December	17	68
TOTAL				
10	30	–	89	232

Source: **compiled by the author**

Let us calculate the speed of the process of the system complicating for commercial organization

LLC “Dniproregionbud” in accordance with the data in Table 4:

$$V_S = \frac{4 \cdot 232 - 10 \cdot 89}{4 \cdot 30 - 10^2} = 1,9.$$

The next step is to determine the coefficient of external adaptation K_A and the coefficient of internal integration (synergy) K_C (29-30), which reflect the correspondence between speeds.

$$K_A = \frac{V_A}{V_C}, \quad (29)$$

$$K_C = \frac{V_R}{V_S}. \quad (30)$$

Thus, we obtain the coefficient of external adaptation and internal integration (synergy) of the commercial organization LLC “Dniproregionbud”:

$$K_A = \frac{6,7}{1,9} = 3,5, \qquad K_C = \frac{4,1}{1,9} = 2,2.$$

6. DISCUSSION OF RESULTS

Thus, for LLC “Dniproregionbud” we have a case when the development of the organization is ahead of changes in the external environment, and at the same time it still maintains the integrity of internal relations. However, this is an unstable state and the organization may at any time lose its integrity and be divided into separate productions, or it urgently needs to restructure, which meets the challenges of the time.

CONCLUSIONS

1. The methodological bases of management of organization evolutionary development through realization of projects portfolio with using of its methods and tools are considered in the work. It is determined that the two main tasks of any organization - external adaptation and internal integration – constantly push the organization to evolutionary development.

2. The viability of the organization is determined by its ability to purposefully adapt to changes in the environment through projects, programs and portfolios. Monitoring the implementation of the portfolio and the organization development criteria allows responding in a timely manner to changes in the external environment.

3. The research hypothesis was confirmed that the destructive force of the viability of a holistic organization as a system in the process of evolution is not in itself a factor of time, but the action of external and internal forces on the organization over a period and failed adaptation, as a gardening of internal integration, can be adjusted by quantifying the energy of the system and implementing appropriate management actions to neutralize or reduce destructive factors. To measure the absolute value of the system's energy, the currency is used as a universal economic unit.

4. The mathematical model of the analysis of a condition and adaptive possibilities of a synergetic portfolio of development projects, which is tested at the analysis of viability of the commercial organization of LLC “Dniproregionbud” is offered. The coefficients of external adaptation and internal integration of the portfolio of development of a commercial organization are calculated using the method of extrapolation, which is based on the assumption of continuation of the current trends in the development of the organization. According to the calculations, it is obtained that the coefficient of external adaptation is equal to 3.5, and internal integration (synergy) equal to 2.2. The results of testing, for this case, showed that the development of the organization is ahead of changes in the external environment, and, at the same time, it retains its internal integrity. The accuracy of the conclusions obtained on the basis of calculations coincides with the actual trends in the functioning of the organization. There are presented an example of calculating the coefficients of external adaptation and internal integration of the development portfolio of a commercial organization with using the method of extrapolation, which is based on the assumption of continuing the existing trends in the organization.

The study of sustainable organizational development management processes on the methodological basis of project management will continue in future publications.

REFERENCES

1. Beck, D. E. & Kovan, K. K. “Spiral Dynamics: Managing Values, Leadership and Change”. *Publ. Open world.* Moscow. Russian Federation: 2010. 420p. (in Russian).

2. “The Project Workout. International organization for the dissemination of best practices in project management”. *Professional Standard.* – Available at: http://www.projectworkout.com/standarts.html. – [Accessed: 24th September 2020].

3. Shirokova, G. V., Merkyrieieva, I. S. & Serova, O. Yu. “Features of the formation of life cycles of

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Russian companies (empirical analysis)". *Russian Management Journal*. 2006; Vol.4(3):3–26 (in Russian).

4. Kozenkov, D. E. "Life cycle of the organization and stages of the life cycle of production systems". *Collection of scientific works Dnipro National University of Railway Transport named after Academician V. Lazarian. Setia: Problems of Transport Economics.* Dnipro. Ukraine: 2011; Vol.2:74–77 (in Ukrainian). – Available at: http://nbuv.gov.ua/UJRN/znpdnuzt_pet_2011_2_15. – [Accessed: 12th September 2020].

5. Lapko, K. S. & Myratova, E. V. "Analysis and development of the enterprise life cycle model" (in Russian). – Available at: http://conference.be5.biz/r2011/1062.htm. – [Accessed: 15th September 2020].

6. Baranovskiy, A. G. & Trenichin, A. N. "Organization (enterprise) life cycle". *Scientific Journal: Economy and Society*. *Part 1. Concept Evolution*. 2014; Vol. 2(11) (in Russian). – Available at: http://www.iupr.ru/domains_data/files/zurnal_11_iun/Baranovskiy%202.pdf. – [Accessed: 20th September 2020].

7. Bushyeva, N. S. "Models and methods of proactive management of organizational development programs: monograph". *Publ. Scientific World*. Kiev, Ukraine: 2007. 199 p. (in Russian).

8. Molokanova, V. M. & Demin, G. K. "The evolutionary model of enterprise development on the basis of portfolio-oriented management". *Bulletin of Pridneprovska State Academy Civil Engineering and Architecture. Publ. PDABA.* Kiev, Ukraine: 2014; Vol. 7(22): 57–65 (in Ukrainian).

9. "A Guide to the Project Management Body of Knowledge. PMBOK® Guide – Sixth Edition". *Professional standard. PMI.* 2017. 537p. – Available at: https://www.pmi.org/pmbok-guide-standards/foundational/pmbok, https://www.pdfdrive.com/a-guide-to-the-project-management-body-of-knowledge-pmbok-guide-sixth-edition-d176101115.html. – [Accessed: 24th September 2020].

10. "The Standard for Portfolio Management – Fourth Edition". *Professional Standard PMI.* 2017. 190 p.

11. Bushuev, S. D. & Bushuev, D. A. "Foundations of Individual Competencies for Project, Program and Portfolio Management (National Competence Baseline, NCB Version 4.0)". *Publ. Summit Book.* Kiev. Ukraine: 2017; Vol.3: 168 p. (in Russian).

12. "IPMA Individual Competence Baseline (ICB) Version 4.0 for Project, Programme & Portfolio Management. IPMA". 2015. 431 p. – Available at: http://products.ipma.world/ipma-product/icb/read-icb/. – [Accessed: 04th September 2020].

13. "A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition" *Professional Standard.* – Available at: https://www.pmi.org/pmbok-guide-standards/about/current-projects. – [Accessed: 24th September 2020].

14. Hordieieva, I. O. "Complementarity of parameters of adaptation of the organization to changes". *XIV International Conference: Project Management in the Development of Society*. Kiev. Ukraine: 2017; Iss.14: 75–76 (in Ukrainian).

15. Velykodniy, S. S. "Method of presenting the assessment for reengineering of software systems with the project coefficients help". *Scientific Journal: Innovative Technologies and Scientific Solutions for Industries.* 2019; Vol.1(7): 34–42 (in Ukrainian). DOI: https:// doi.org/10.30837/2522-9818.2019.7.034.

16. Velykodniy, S. S. "Analysis and synthesis of the results of complex experimental research on reengineering of open CAD systems". *Scientific Journal: Applied Aspects of Information Technology*. 2019; Vol. 2(3): 186–205. DOI: 10.15276/aait.03.2019.2.

17. Molokanova, V. M. "Formation of project alternatives for the development portfolio of the organization taking into account the criteria of values". *A National Scientific and Technical Journal: Theory and Practice of Metallurgy. Publ. NMetAU.* Dnipro. Ukraine: 2013; Vol.3–4: 72-77 (in Ukrainian).

18. Vlasova, T. I. & Vlasova, O. P. "The reception of the conceptual sphere of "the good" in discourses and in-terpretations of postmodernism". *Publ. Grani*. Dnipro. Ukraine: 2017; Vol.20(12): 5–11 (in Russian). DOI: 10.15421/1717157. – Available at: http://nbuv.gov.ua/UJRN/Grani_2017_20_12_3. – [Accessed: 01th October 2020]

19. Velykodniy, S. S. "The idealized models of software systems reengineering". *Scientific Journal: Radio Electronics, Computer Science, Management.* 2019; Vol.1: 150–156 (in Ukrainian). DOI: 10.15588/1607-3274-2019-1-14.

20. Petrenko, V. O. & Kulik, V. O. "Innovation management processes during the life cycle of the project". *Collection of Scientific Works: Management of Development of Complex Systems.* Kiev. Ukraine: 2018; Vol.36: 35–41 (in Ukrainian). – Available at: http://urss.knuba.edu.ua/files/zbirnyk-36/7.pdf. – [Accessed: 24th September 2020].

21. Bell, D. "The Coming Post-Industrial Society: The Experience of Social Forecasts". *Publ. Academy*. Moscow, Russian Federation: 2000. 244 p. (in Russian).

22. Bob de Wit & Ron Meyer. “Strategy – Process, Content, Context. An International Perspective”. *Publ. Cengage Learning.* London. United Kingdom: 2004. 1252 p.

23. Hordieieva, I. O. “A method of comprehensive assessment of the adaptability of projects and programs to risks”**.** *Collection of Scientific Works: Management of Development of Complex Systems.* Kiev, Ukraine: 2014; Vol.17: 12–18 (in Ukrainian). – Available at: http://urss.knuba.edu.ua/files/zbirnyk-17/5.pdf. – [Accessed: 14th September 2020].

24. Hordieieva, I. O. & Teslenko, T. V. “The process of adapting an organization to change”**.** *Bulletin of Pridneprovska State Academy Civil Engineering and Architecture. Publ. PDABA.* Dnipro, Ukraine: 2014; Vol. 9(198): 33–43 (in Russian). – Available at: http://nbuv.gov.ua/UJRN/Vpabia_2014_9_8. – [Accessed: 05th September 2020].

25. Dokinz, R. “Selfish gene”**.** *Publ. Ecsmo.* Moscow. Russian Federation: 2006. 218 p. (in Russian).

26. Savina O. Yu. “Conceptual model of the value-oriented management of project portfolios of science-based enterprises”. *Admiral Makarov National University of Shipbuilding*. Mykolaiv. Ukraine: 2017; Vol.4: 80–88 (in Ukrainian). DOI: 10.15589/jnn20170411

27. Bazhin, I. I. “Management of differences”. *Publ. Konsum.* Kharkov. Ukraine: 2004. 392 p. (in Russian).

28. Vlasova, T. I. & Martseniuk, L. V. “Interpretive subjectivity and gender relativism in the theories of postmodernism”. *Interdisciplinary Studies of Complex Systems*. 2019; Vol.14: 99–105. DOI: org/10.31392/iscs.2019.14.099.

29. Dzhucha, V. M. & Saakov, A. S. “System stabilization in crisis management as a means of avoiding bankruptcy”. *Economic Systems Management: Electronic Scientific Journal.* 2014; Vol. 12(72) (in Russian). – Available at: http://uecs.ru/uecs-72-722014/item/3233-2014-12-16-08-03-55. – [Accessed: 03th October 2020]

30. Korotkov, E. M. “Crisis Management: A Study Guide”. *Publ. Infra-M.* Moscow. Russian Federation: 2014. 406 p. (in Russian).

31. Shtapauk, S. S. “Entropy as a measure of the orderliness of the economic system”. *Scientific Journal: Bulletin of the Volodymyr Dahl East Ukrainian National University.* 2017; Vol.6(236): 250-256 (in Ukrainian). – Available at: http://dspace.snu.edu.ua:8080/jspui/bitstream/123456789/2258/1/250-256.pdf. – [Accessed: 24th September 2020].

32. Savysin, M. P. “Entropy-negentropy measurement of system cimplicity-complexity”. *Perspectives Publ. Scientific journal: Socio-political Magazine. Philosophy, Political Science, Sociology*. 2015;Vol.1: 106–120 (in Ukrainian). – Available at: http://nbuv.gov.ua/UJRN/Perspekt_2015_1_19. – [Accessed: 24th September 2020].

33. Sedov, E. A. “Information-entropic properties of social systems” (in Russian). – Available at: http://ecsocman.hse.ru/data/149/386/1217/009_SEDOV.pdf. – [Accessed: 20th September 2020].

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Дослідження кореляції темпів адаптивності організації відносно її внутрішньої цілісності

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АНОТАЦІЯ

У сучасному проектному менеджменті фокус управління все більше зміщується від управління окремими проектами до управління стратегічним проектно-орієнтованим розвитком організацій. Наразі назріла потреба приділяти більше уваги проектному менеджменту у якості універсального інструменту розвитку систем будь-якого рівня. Ціллю статті є дослідження процесів адаптації до змін через синергетичний портфель проектів на основі стратегічного плану розвитку та еволюціювання організації. Розглянуто спіральний рух розвитку систем для вивчення процесів розвитку: процес переходу організації від одного стабільного стану до іншого, процес радикальних змін, що супроводжує інноваційну діяльність, а також процеси наростання і розвитку кризових явищ. Розглянуто методологічні засади управління еволюційним розвитком організації через реалізацію портфельного управління з використанням його методів і інструментів. Запропоновано управління еволюційним розвитком організації здійснювати шляхом побудови дій у вигляді синергетичного портфелю проектів відповідного змісту, з метою збільшення цінності реалізації всього портфелю проектів над цінністю від реалізації окремих проектів. Синергетичний портфель проектів розглядається, як інструмент гармонійного переходу в бажаний еволюційний стан, шляхом збереження внутрішньої цілісності організації та забезпечення її стійкості. Запропоновано математичну модель оцінки бажаних властивостей та відносин синергетичного портфеля проектів організації, що дозволяє визначити та мінімізувати величину неузгодженості еволюційних цілей розвитку організації та стійкості поточного стану. Визначено, що два головні завдання будь-якої організації – зовнішня адаптація і внутрішня інтеграція – постійно штовхають організацію до еволюційного розвитку. У статті запропоновано авторський підхід до управління еволюційним розвитком організації через портфель проектів, визначені показники адаптації організації до змін зовнішнього середовища, визначені умови збереження цілісності організації в процесі організаційних змін на основі енергетичного підходу, проведені контрольні розрахунки для аналізу збереження життєстійкості організації.

Ключові слова: портфель проектів; адаптивність організації; еволюціювання організації; адаптація організації; зовнішні умови; синергетичне управління; життєстійкість; теорія цінностей

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Исследование корреляции темпов адаптивности организации относительно её внутренней целостности

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АННОТАЦИЯ

В современном проектном менеджменте фокус управления все больше смещается от управления отдельными проектами к управлению стратегическим проектно-ориентированным развитием организаций. Сейчас назрела необходимость уделять больше внимания проектному менеджменту в качестве универсального инструмента развития систем любого уровня. Целью статьи является исследование процессов адаптации организаций к изменениям внешней среды через синергетический портфель проектов, сформированный на основе стратегического плана развития и процессов эволюции организации. Рассмотрены спиральное движение развития систем для изучения процессов развития: процесс перехода организации от одного стабильного состояния к другому, процесс радикальных изменений, который сопровождает инновационную деятельность, а также процессы нарастания и развития кризисных явлений. Рассмотрены методологические основы управления эволюционным развитием организации через реализацию портфельного управления с использованием его методов и инструментов. Предложено управления эволюционным развитием организации осуществлять путем планирования действий в виде синергетического портфеля проектов соответствующего содержания, с целью увеличения ценности всего портфеля проектов относительно ценности от реализации отдельных проектов. Синергетический портфель проектов рассматривается как инструмент гармоничного перехода в желаемое эволюционное состояние, путем сохранения внутренней целостности организации и обеспечения ее устойчивости. Предложена математическая модель оценки желаемых свойств и отношений синергетического портфеля проектов организации, которая позволяет определить и минимизировать величину рассогласования эволюционных целей развития организации и устойчивость текущего состояния. Определено, что две главные задачи любой организации - внешняя адаптация и внутренняя интеграция - постоянно толкают организацию к эволюционному развитию. В статье предложен авторский подход к управлению эволюционным развитием организации через портфель проектов, определены показатели адаптации организации к

изменениям внешней среды, определены условия сохранения целостности организации в процессе организационных изменений на основе энергетического подхода, проведены контрольные расчеты для анализа сохранения жизнестойкости организационной системы.

Ключевые слова: портфель проектов; адаптивность организации; эволюция организации; адаптация организации; внешние условия; синергетическое управление; жизнестойкость; теория ценностей

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