Сучасний стан наукових досліджень та технологій в промисловості. 2020. № 1 (11)
ISSN 2522-9818 (print)
ISSN 2524-2296 (online)

UDC 065.012.32
DOI: https://doi.org/10.30837/2522-9818.2020.11.035

D. BUSHUIEV, B. KOZYR

HYBRID INFRASTRUCTURE PROJECT MANAGEMENT METHODOLOGIES

The **subject** of this article is the development of hybrid methodologies for managing projects, programs and project portfolios. Significant reductions in the life cycles of infrastructure programs, which contain projects of different lines of activity and different management methodologies, for example, waterfalls with a rigid life cycle and Agile with a flexible methodology life cycle, require the use of convergence tools to form "hybrid" methodologies. The **goal** is to develop a convergent approach to building hybrid project management methodologies in terms of decision-making processes in project management based on various platforms. **Results** of the studies were obtained using a convergent approach to building methodologies for managing infrastructure projects and programs. A substantial model of the resulting hybrid methodology for managing infrastructure projects and programs is presented. **Conclusions**: Hybrid methodologies for managing infrastructure projects and programs are becoming more popular in this category of programs. The main reason is the presence in the program of components with different life cycles, and, consequently, methodologies that require integration and harmonization. The methodology is tested by the practice of using mechanisms of hybrid multilevel management of infrastructure projects and programs. The study of hybrid infrastructural program management methodologies is defined by the practice of introducing different components of programs. The application of the hybrid project management methodology allowed the authors to execute different projects in essence within the stipulated timeframe with the given budget and quality of construction projects and projects of creation of information and communication infrastructure management systems. Further areas of research are related to the elaboration of harmonization, integration, convergence and actualization mechanisms.

Keywords: convergence model; hybrid management methodologies; infrastructure program; basic project management methodology interaction model; program manager.

Introduction

The analysis of the tendencies of the development of infrastructure projects and programs has determined that the key factors for their success are taking into account the specifics of managing each class of projects included in the infrastructure program, reliability of implementation, efficiency in value creation and ecological harmonization in the light of turbulent environment. At the same time, improving the level of implementation of infrastructure programs is a strategic direction for Ukraine's development. The conducted analysis of the status and problems of the existing infrastructures of regions, cities, settlements and consumers of Ukraine has determined the relevance and practical importance of research on the implementation of complex infrastructure projects in turbulence based on the construction of a hybrid methodology for project and program management within a converged balanced approach [1]. The authors have developed a holistic model for solving problems of implementation of infrastructure projects and programs on the basis of dual (management with simultaneous learning, rational models) management within hybrid methodologies that combine different principles and life cycles of the management model. Experimental studies of the proposed hybrid approaches, models and methods of managing infrastructure programs have confirmed their adequacy and effectiveness.

Today, there is relatively little work in the known literature in which research would focus on various aspects of such an important direction of development as the effective management of infrastructure projects and programs to successfully implement them through a hybrid management methodology with parallel training of models to reduce uncertainty in program implementation. Also, insufficient attention was paid to project management of the implementation of infrastructure programs on the basis of prudent management [2, 3]. Of particular relevance to the uncertainty, challenges and challenges of the program's external and internal environments is the acquisition of such large-scale and long-lasting infrastructure programs. This class includes state targeted programs for the development of territorial systems, as a major component of Ukraine's development. Currently, the configuration of infrastructure development programs is based, as a rule, on the use of stationary models that do not take into account the variety of projects and management methods, and the dynamics of the external environment over the period of program implementation. On the other hand, in certain segments of the critical path of the program not only the values of the parameters of the environment, but also their methodologies and the priority in making management decisions change.

Current trends in the global development of project-oriented organizations that implement program and program infrastructures are accompanied by the development of their competence and technological maturity [41]. The activities of project-oriented organizations are generally mobile and based on generally accepted rules for implementing infrastructure programs and programs. This concerns the involvement of productive forces caused by cost minimization and environmental compliance. The basis for balanced development in the implementation of infrastructure projects is an innovative upgrade aimed at increasing the quality of products and services, enhancing their competitiveness through the implementation of best international practice [5]. The key factors are quality enhancements and the ability to create value and generate value [6].

Infrastructure programs, regardless of their type, operate in accordance with their organizational management strategies, which are based on a focus on the development and satisfaction of stakeholders. In a competitive environment, such strategies of infrastructure

ISSN 2522-9818 (print)
ISSN 2524-2296 (online) Innovative technologies and scientific solutions for industries. 2020. No. 1 (11)

programs are in many cases designed to support or create competitive advantages over other organizations or the competitive value of infrastructure program products [7, 8]. In the course of their activities, organizations must adapt the strategies of infrastructure programs to the influences of the external environment and internal dynamics. At the same time, it is necessary to find ways of effective investment of management resources in the application of appropriate methodologies, for timely achievement of the planned strategic indicators of infrastructure programs and programs [9].

The purpose of the article is to develop a convergent approach to building hybrid methodologies for managing infrastructure projects and programs from the perspective of decision making processes within boundaries based on different methodological platforms and standards.

Research methodology

Infrastructure programs should not only be aimed at building (development) of a complex or large-scale system, they should take into account the development of concepts, changes in organizational structures and teams of managers [9]. In an infrastructure program designed to develop a new type of product (service), the use of new technologies [10, 11] and the concept of overall success management are crucial. Strategic management of the infrastructure program identifies elements of strategy that are critical to achieving the mission of the program, and creates a program structure for combining key elements [12, 13]. Managing an infrastructure program strategy is primarily about establishing a mission and managing its mental space [14].

In the practice of managing infrastructure programs, three approaches to strategy implementation are applied.

The first type of approach is to establish certain principles and / or implement an appropriate structure for the day-to-day operations, basic and minor decisions to enhance the professionalism and culture of the organization's members. This technique is developed to create a well-managed organization.

The second type approach is aimed at the development of new techniques and mechanisms for their implementation, which the organization can apply in work with both technological processes (equipment and technology) and management (business processes and business models).

The third type approach defines the mechanism of cyclical creation of new values, such as products and services, that provide organizations with success, which in turn defines the existing values of the organizations themselves.

For each approach, a specific activity profile scheme should be defined [15, 16].

Value creation is seen as a core concept of an infrastructure program that is phased out. The program begins by identifying the kind of values that you want to create, then moving on to value creation actions, and determining when to manage a value adjusting activity. Most important in this work is the process of defining the vision, mission and strategy, which aims to prepare the infrastructure program by identifying problems and formulating key areas of the strategy. This process consists of:

- contextual analysis of the situation for the correct presentation of the complete picture (status) of the infrastructure program, including the environment;
- preparation of alternative scenarios.

In order for the management of the infrastructure program to be dynamic, with adequate response and to provide compensation for changes in the environment, the infrastructure program manager must forecast trends in the environment in the short and long term. It is necessary to model numerous scenarios of the situation development. To achieve this, the program team must begin with a thorough analysis of the current state and modeling of the desired state in the future. Leaders of the organization should formulate the main purpose of the infrastructure program in the form of a mission and justify in it the reason for the existence of the infrastructure program itself. This sets the stage for stakeholders to share the concept of the management team, increase their involvement in the implementation of the infrastructure program, and increase awareness of the issues through active collaborative learning and motivation.

In the next stage, the infrastructure manager sets out a clear goal for which management activities should be directed. This objective is formulated in the form of a concept or task of finding ways to implement an infrastructure program, in other words, identifying ways of achieving a mission to decide which program management methodologies to use. At this stage, it is desirable, whenever it’s possible to describe the steps required to carry out the mission of the infrastructure program in the form of specific objectives. Infrastructure program management tools investigate, narrow, and sift through numerous scenarios and related management methodologies for the implementation of the infrastructure program, selecting a specific scenario that becomes the basis for further management and evaluation of the infrastructure program architecture.

Consider contextual analysis as a method of comprehending and presenting a holistic picture of an infrastructure program. This analysis is used to interpret the mission and strategy mainly when the interacting multiple values of the infrastructure program are expressed in abstract terms. In context analysis, the rules that shape the system or the appropriate methodology for generating a general context must be presented visually, and the requirements of the client or specialist from the infrastructure planner should be maximally embodied.

Study results

Appropriate knowledge is applied to solve complex infrastructure program management problems, diagnostics are made, and the relationship between the whole and parts is improved by maintaining the right balance between the overall management of the whole and the autonomy of the parts, often different in nature of

ISSN 2522-9818 (print)
Сучасний стан наукових досліджень та технологій в промисловості. 2020. № 1 (11) ISSN 2524-2296 (online)

implementation and life cycles. This is necessary because the essence of managing infrastructure program is to generate decisions while reducing managerial uncertainty, the programs are considered as a whole, are reciprocal, and must be coordinated to ensure the smooth progress of the infrastructure program. Therefore, bureaucratic obstacles between the implementation of different components of an infrastructure program must be eliminated in order for the programs to interact in a harmonious way and to produce results defined by the mission. For this reason, program management establishes specific rules for the interaction between component and projects, maintains and ensures the inherent autonomy of programs.

In order to build relationships between the whole and parts and to align them with the content of the mission and the strategy of the infrastructure program, the project management should analyze and determine the principles and organization of the relationship, the behavior of the whole and its components. Both the rules for managing the infrastructure program and the principles and methodologies of management for reaching a compromise and determining the direction of action in the organizations implementing the programs should be established and, if necessary, revised and improved.

Infrastructure program management is designed to interpret mission-defined, mission-relevant components and values at the strategic level to identify synergies across the subject areas, objectives, goals and tools, implementation of integration management, which focuses on prioritizing implementation of components in all program implementation processes.

The conceptual model proposed in the study is based on the organization's life cycle, problems and challenges related to specific situations during the infrastructure project lifecycles, early warning indicators, and proactive impact model generation during program implementation [17].

For the purpose of understanding the terms that are not well known, here are the basic definitions of the study.

Definition 1. By the hybrid methodology, we define a methodology that combines different management principles and methodology approaches. For example: Agile with flexible lifecycle, Waterfall lifecycle PMBoK, Value-based P2M and Prince 2 with Gateway project phase management model.

Definition 2. Proactive management is based on forecasting and decision making based on a vision of the future and challenges or perturbations.

Definition 3. Threat is a net risk that is damaging and has a critical or a negative impact on the status and success of a project or program.

Definition 4. Bifurcation is a critical state of the system in which two scenarios of its development are possible. It's a rise or fall. A bifurcation point is a change in the system's default mode.

Definition 5. Value determines the benefits a stakeholder receives. In projects and programs, value must be balanced across all stakeholders.

Definition 6. Turbulence is a state of the system or its environment that generates the uncertainties (vortices, tsunamis, or other forms) in organizational development processes. In this case, the development of the system is significantly inhibited or accelerated.

The conceptual diagram of infrastructure program management based on the hybrid methodology is shown in fig. 1.

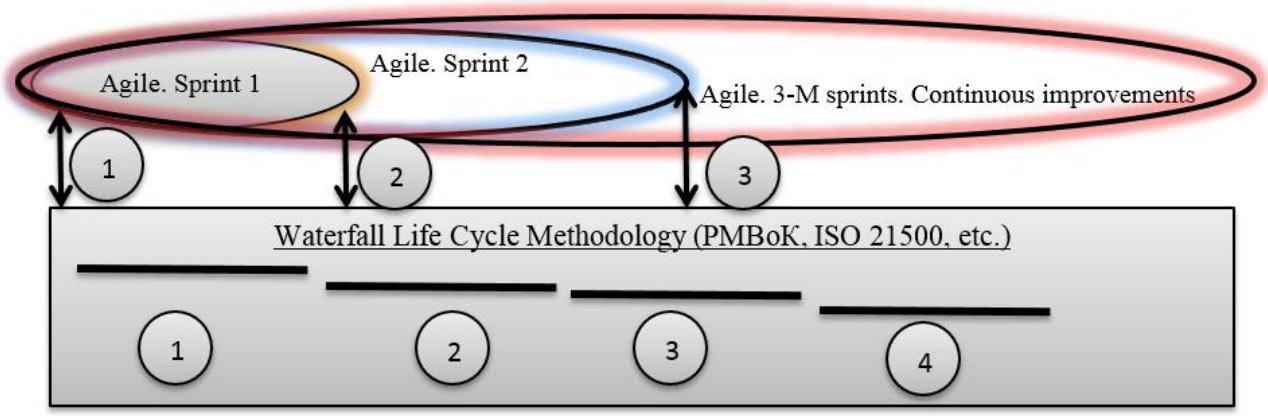

Fig. 1. Conceptual scheme for managing infrastructure programs based on hybrid methodology

This example provides an overview of how Agile and PMBoK methodologies work together. Two sprints are highlighted in the Agile methodology. At the first sprint a minimum working product was created. The second sprint is where a working product is created with the necessary features that support the functioning of this component of the infrastructure project. The third and subsequent sprints are dedicated to the system of continuous improvement (Kaizen). The waterfall life cycle methodology outlines 4 phases of the projects. Hybrid methodology models 1-3 are harmonized, integrating, converging and updating based on relationships 1-3. These operations are shown in fig. 2 when developing a hybrid methodology for managing infrastructure programs based on genomic representations of components.

Managing the success of an infrastructure program can only be guided by value vectors for different stakeholder groups, use trends to accelerate development, convergence of knowledge, timely change in management paradigms, understanding the philosophy of life cycles, [18]. Each of these elements is part of the success of the

ISSN 2522-9818 (print)
ISSN 2524-2296 (online) Innovative technologies and scientific solutions for industries. 2020. No. 1 (11)

infrastructure program, and the formula for success is determined by the synergy of their interaction [1].

The return from a proactive to a reactive management method is associated with the transformation of a challenge into a problem. The term proactivity is called the period of transformation of a call into a problem. The proactive term assessment approach is used in software development projects based on Agile methodology. For example, in a definition such as proactive protection of an infrastructure program means a set of technologies used in information and communication systems. The main purpose is to identify potentially dangerous software and eliminate its impact or the code itself within the operating software systems. Unlike other technologies, they warn and try to block dangerous activity, rather than detecting a known malware on the system. It uses a model of active bifurcation points that are linked to life-cycle events and change the priorities of the infrastructure components to implement one of the strategies – anti-crisis, stabilization and sustainable development.

Stakeholder management philosophy assumes that their claims are legitimate and therefore subject to consideration. It should be noted that those interpretations of the stakeholder concept that limit the legitimacy of their claims should be rejected for economic reasons as they ignore the fact that the organization's resources are limited. Unlimited satisfaction is not possible because it will cause a shortage of the exchange product. For their part, the stakeholders in many cases do not intend to relinquish their claims without resistance. In practice, this leads to political processes in the relations between groups, in particular, to the struggle for the distribution of material and other goods.

Let's consider a generalized model for implementing infrastructure programs in which companies from several countries are involved.

The model is represented as:

$$\mathrm{K} =< \check{E}, \breve{O} >,$$

where $\check{E}$ – the environment of the infrastructure program; $\breve{O}$ – model of infrastructure program implementation activities.

The environment of the organization $\check{E}$ is also considered as a fractal consisting of self-similar models of the cultural, political and economic environment of the countries where the organizations that are involved in the implementation of the infrastructure program are operating.

$$\check{E} = \{E_1, E_2, E_i ..., E_n\},$$

where *n* number of countries where the organization does business.

Accordingly, a project-oriented organization contains a number of separate units in these countries and is displayed by a fractal model $\check{D}$ in the organization of self-similar in structure and functions of organizations.

$$\check{D} = \{D_1, D_2, D_j ..., D_m\},$$

where *m* number of organizational units.

On the basis of the divisions of the organization $\check{D}$, a model of its activity $\breve{O}$ is formed on the basis of a conceptual scheme of value creation and migration in the cultural, political and economic environment. At the same time, organizational units in different countries have self-similar structures. This makes it possible to apply fractal models to the formation of control mechanisms.

Model of the environment of the organization:

$$\forall E_i \in \breve{E} \exists M_i^0 = \langle \breve{R}_i, \widehat{G}_i, C_i \rangle,$$

where M_i^0 – the environment model of the organization in the *i*-th country; $\breve{R}_i$ - model of market and country influence on organization activity; $\widehat{G}_i$ – model of interaction with partners in the i-th country; C_i – model of interaction with competitors in the i-th country.

Let the model of activity in each country be formed as:

$$\forall D_j \in \check{D} \exists O_j^0 = \langle P_j, \widehat{R}_j, \widehat{U}_j \rangle,$$

where O_j^0 – model of the organization's activity in the *j*-th country; P_j – model of product creation in the *j*-th country of the organization; $\widehat{R}_j$ – production model in the *j*-th country; $\widehat{U}_j$ - management model in the *j*-th country.

The interaction model is determined by the matrices Ψ_o, Ψ_p, Ψ_c expressed in the form of multipliers that interact through dampers or risk acceptors of market influence on the organization, partners, and competitors. Here Ψ_o is a matrix of the impact of the environment on organizations; Ψ_p – matrix of influence of environment on partners; Ψ_c is the matrix of influence of environment on competitors. The elements of the matrices $\Psi_o[1, j], \Psi_p[1, j], \Psi_c[1, j]$ determine the influence of the environment on the activity of the unit of the j organization. The elements of the matrices $\Psi_o[2, j], \Psi_p[2, j], \Psi_c[2, j]$ determine the influence of the activity of the unit j of the organization on the environment. The model of influence, which determines the immune mechanisms, includes coefficients distributed over five risk zones of influence of critical factors on the state of the organization and future destruction. The model is based on trends monitored by the project team on a scale of estimates Ω:

Suppose that for each element of the matrices $\Psi_o[1, j], \Psi_p[1, j], \Psi_c[1, j]$, $F_o(\Omega_j), F_p(\Omega_j), F_c(\Omega_j)$ mechanisms of control of the hybrid methodology – market dampers and competitors and risk absorbers passed on to the partners of the infrastructure program are known.

Then, the organization's infrastructure management mechanism implements the following steps for each unit:

Сучасний стан наукових досліджень та технологій в промисловості. 2020. № 1 (11)
ISSN 2522-9818 (print)
ISSN 2524-2296 (online)

Assessment of the state of the environment for each unit of the organization Ω_j.

For each unit of the organization, the value of risk absorption is assessed through their transfer to contract partners and the company as a whole.

$$\forall_j = \overline{1, j} : F_p^{MK} = \sum F_p\left(\Omega_j\right),$$

where j – the number of countries in which the organizational units are located, F_p^{MK} the total amount of potential losses transferred to partners.

For each unit of the organization, the values of accepted threats, risks of market behavior and possible damping of their negative impact on the organization as a whole are evaluated.

$$\forall_j = \overline{1, j} : F_o^{MK} = \sum F_o\left(\Omega_j\right),$$

where F_o^{MK} the total amount of potential losses from the negative impact of the market in the *j*-th country.

For the organization the values of the accepted threats, risks and their partial transfer to the panthers are evaluated

$$F = F_o^{MK} F_c^{MK} F_p^{MK},$$

where F – the total amount of losses from the negative impact of the environment of the infrastructure program.

The values of losses that form the maximum negative impacts of the market or competitors are highlighted.

$$\forall_j = \overline{1, j}, \Psi_e = \max\left(F_o\left(\Omega_j\right), F_c\left(\Omega_j\right)\right).$$

For each maximum loss value Ψ_e, an anti-crisis project is formed, which assesses the C_e costs and the BCR cost benefit indicator. If the BCR factor is greater than 1, then this project is placed in the pool of projects of crisis management.

If there are not yet considered $F_o\left(\Omega_j\right), F_c\left(\Omega_j\right)$, then another iteration occurs and goes to p. 3.

After the infrastructure program pool is formed, it is selected into the current project portfolio. The selection of projects is subject to limitations

$$\sum_1^e C_e \le B_p,$$

where B_p is the budget of the infrastructure program for the current period.

In order to build an effective hybrid infrastructure project management methodology, the feasibility of using genomic representations of the portfolio management, program and project management methodologies is substantiated [2, 3].

We will analyze the use of genomic representations of management methodologies, taking into account existing problems of financial organizations, turbulence of internal and external environment. The problems can be divided into four groups: definition of purpose, goal achievement, organizational competence and organizational behavior (fig. 2).

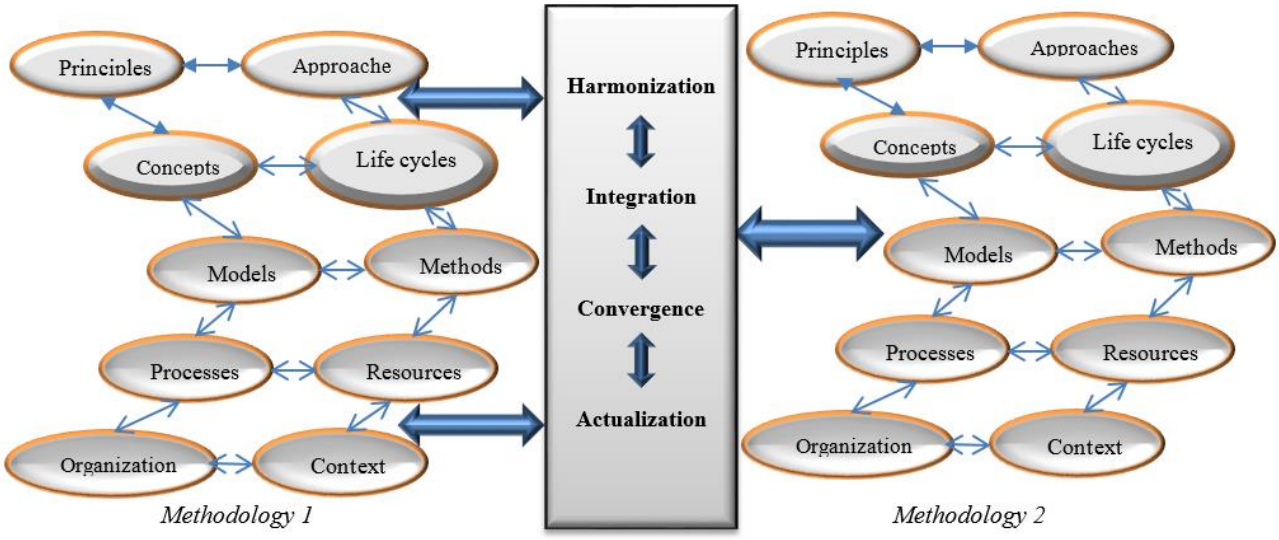

Fig. 2. Genome model of hybrid infrastructure program management methodologies

As an example, consider the step-by-step formation of methodologies. The use of interaction mechanisms depends on the level of maturity of project management in the organization [17]. At low levels of maturity, the methodology is not fully needed and may not be represented by all elements. At the high levels of maturity, organizations implementing large-scale, integrated programs and projects require a methodology that has the full range of elements that contain all the variety of elements needed. That is, for the most complex and hypothetically diverse portfolio of programs and projects, the methodology approaches a "hypothetically complete system".

The knowledge carrier of the methodology formed is based on this model. The formalized model of the methodology genome is written as follows

$$M = \langle P, K, A, L, Y, D, V, O \rangle.$$

ISSN 2522-9818 (print)
ISSN 2524-2296 (online) Innovative technologies and scientific solutions for industries. 2020. No. 1 (11)

Let there be a set of principles that define the methodology:

$$P = \{p_1, p_2, ..., p_n\}.$$

This set must have the properties of completeness and consistency. As part of the implementation of the principles and alternative concepts, many approaches are known to be used in determining the methodology:

$$A = \{a_1, a_2, ..., a_m\}.$$

Alternative concepts can be formed based on these principles:

$$K = \{k_1, k_2, ..., k_i\}.$$

The methodology should be acceptable for multiple project life cycles:

$$L = \{l_1, l_2, ..., l_r\}.$$

Models and methods for managing projects, programs, and portfolios are superimposed on combining models. These models, methods and mechanisms are implemented based on the process components of the methodology:

$$Y = \{y_1, y_2, ..., y_q\}.$$

The documents that accompany the management process system are defined as a set of:

$$D = \{d_1, d_2, ..., d_z\}.$$

Each methodology is linked to the corporate culture of management (culture is expressed through a set of cultural values):

$$V = \{v_1, v_2, ..., v_c\}.$$

This methodology should be linked to the organizational environment and context:

$$O = \{o_1, o_2, ..., o_g\}.$$

where the indices n, m, i, r, q, z, c, g determine the number of elements of each set, which describes the genome of methodologies.

In this model, we will distinguish two mechanisms: systematization within each level and harmonization between the levels of the model.

The harmonization mechanism provides a systematic elaboration of models at each level. The elements of each level are systematized based on the adjacency matrix.

The integration mechanism ensures the formation of a complete model of the hybrid methodology. This integration depends on the specifics of each methodology that is included in the hybrid.

The convergence mechanism ensures the interpenetration of best practices (solutions) within the framework of applied methodologies.

The update mechanism prepares a hybrid methodology for implementation.

Each of these mechanisms has a complex structure, functions inputs and outputs. Such mechanisms will be defined in detail in the following publications of the authors.

For example, relationships at the first level between principles and approaches are systematized by the adjacency matrix. At the same time, the matrix elements determine the system compatibility of individual principles and approaches. A value of 0 indicates that elements do not match or do not interact with each other, and 1 indicates that they are fully consistent and have the maximum interaction. Similarly, matrices are formed at other levels of the model. The task of the systematization mechanism is to determine the system compatibility of the selected elements of methodologies. In this case, the term "genetic code of the project (program)" will mean its system model, which includes an initial idea of the "vision" of the project or program product, an integrated process for the development of a specific functional activity, built for the entire life cycle of the project, tools for its interaction with the external environment. At the same time, the genome of project management methodologies, project and program portfolio management have the same spiral structure for different content. We introduce the concept of algebra of project management methodologies:

$$A = \langle \check{S}, \Omega \rangle,$$

where $\check{S}$ – carrier of knowledge of methodologies, placed in the genome; Ω – a signature that defines a set of operations on methodology elements.

The signature contains operations for projecting individual elements of the methodology and their groups, combining, intersecting, and supplementing methodologies, and so on.

The purpose of the genetic code of projects, programs and portfolios is navigation in the implementation of functions and development processes. At the same time, the Navigator, moving through the phases and steps of the life cycle, uses information from the genetic code – its interconnected structures in the management processes. Most often, the process of forming the genetic code of a project occurs spontaneously, based on the intuition and practice of project management of the organization. Moving further in the application of project management analogies in the field of genomic models, we will distinguish two additional genomes of the hybrid model - the genome of competencies in methodology 1 and the genome of competencies in methodology 2. These genomes intersect at the point where project competencies are implemented at the expense of project manager's competence. This interaction forms the "chromosome" of the project [17].

An example of the application of a hybrid infrastructure program management methodology

As an example of application of methodology of profile of mission and strategy of implementation of the infrastructure program which was implemented in PJSC

ISSN 2522-9818 (print)
Сучасний стан наукових досліджень та технологій в промисловості. 2020. № 1 (11) ISSN 2524-2296 (online)

"Mykolaiv bread factory". Today, this organization has facilities for storage and processing of cereals, production and granulation of compound feed, bran. The mission of the infrastructure program for the development, reconstruction and modernization of the production facilities of the Public Joint Stock Company "Mykolaiv bread factory" was to increase, diversify production facilities, increase logistical and commercial attractiveness, by reconstruction, modernization of existing fixed assets and construction. The strategy of the infrastructure program determines the order of construction, reconstruction and modernization of production facilities of the program of development of PJSC "MBF", provided that in the near future from the beginning of the implementation of the development program, the company will be able to receive income from the commissioned new production facilities without waiting for completion all projects [19].

This strategy allowed in a short time, not more than one and a half years, to complete the implementation of the development program, while not stopping production activities, gradually increasing the capacity of services, production. The purpose of creating a linear object of engineering and transport infrastructure to ensure stable cargo flow through berth No. 10 of Mykolaiv seaport through public-private partnership is to increase the volume of cargo processing and diversify cargo flows through the berth, to increase the logistical and commercial attractiveness of seaport and its technical re-equipment.

The structure includes the infrastructure program includes the following components:

- project No. 1 – "Silo-type storage facility for storage of agricultural products with auxiliary buildings and structures";
- project No. 2 – "Item No. 1 for receiving loads of agricultural products with auxiliary buildings and structures";
- project No. 3 – "Item No. 2 for receiving loads of agricultural products with auxiliary buildings and structures";
- project No. 4 – "Storage of silo type No. 2 for storage of cargoes of agricultural products with auxiliary buildings and structures";
- project No. 5 – "Non-residential buildings of the elevator complex (reconstruction of the elevator building - lit. F1-5 with an extension of the tower No. 2"
- project No. 6 – "Thermal Station with Auxiliary Buildings and Structures";
- project No. 7 – "Linear object of engineering and transport infrastructure - gallery for transportation of goods of agricultural products";
- project No. 8 – "Creation of information system for management of the infrastructure program of PJSC "Mykolaiv bread factory" according to Agile methodology.

Projects No. 1–7 were created using the "waterfall model" of management.

A panorama of the results of implementing the infrastructure program is shown below (fig. 3).

Fig. 3. Panorama of the results of the implementation of the infrastructure program of PJSC " Mykolaiv bread factory

The given infrastructure program "creation of a linear object of engineering and transport infrastructure to ensure stable cargo flow through berth No. 10 of the Mykolaiv seaport has been successfully completed and the constructed objects of the grain terminal have been put into operation.

The implementation of this program allowed to solve the following tasks:

a) create additional port facilities, expand existing port infrastructure;

ISSN 2522-9818 (print)
ISSN 2524-2296 (online) Innovative technologies and scientific solutions for industries. 2020. No. 1 (11)

b) to increase the receipt of budgets of all levels and trust funds, the collection of port fees by increasing the volume of cargo through berth No. 10 of the seaport;

c) to expand the integration of the seaport with the business lines of the OREXIM Group of Companies through attractive service, differentiated flexible tariff policy, optimal logistics;

d) optimize and develop the structure of the port;

e) to create conditions for attracting sustainable freight traffic;

f) to increase, gradually after three years, the cargo turnover of the seaport by approximately 1800 thousand tons per year, increase the number of ship activities by 156 units per year, which will result in a significant increase in the revenues from the port fees at berth No. 10 not less than UAH 50.987 million per year, from the service of access of the port operator to the berth No. 10 additionally at least UAH 6,552 million per year, payments to the state budget of at least UAH 33.749 million annually.

Conclusions

1. The study of hybrid methodologies for managing infrastructure programs is determined by the practice of implementing program components that differ in their essence.

2. The use of a hybrid project management methodology allowed the authors to complete essentially different projects within a specified time frame with a specified budget and quality of construction projects and projects for creating information and communication systems for infrastructure management.

3. Further research areas are related to detailed elaboration of mechanisms for harmonization, integration, convergence and actualization.

References

1. Bushuyev, S., Verenych, O. (2018), "Organizational Maturity and Project: Program and Portfolio Success", *Developing Organizational Maturity for Effective Project Management (Chapter 6: Organizational Maturity and Project: Program and Portfolio Success), Under the head. ed. G. Silvius&G. Karayaz*, IGI Global, P. 349 (chapter 6 P. 104–127). ISBN13: 9781522531975 /ISBN10: 1522531971 /EISBN13: 9781522531982. DOI: 10.4018/978-1-5225-3197-5
2. ISO 21500:2012 (2012), *Guidance on project management*, Project Committee ISO/PC 236, ISO, 36 p.
3. *The Standard for Program Management – Fourth Edition* (2017), Project Management Institute, 2006, 104 p.
4. Azarov, N. Ya., Yaroshenko, F. A., Bushuev, S. D. (2011), *Innovative mechanisms for managing development programs*, Kyiv : Summit Book, 564 p.
5. Lefley, F., Sarkis, J. (2005), "Applying the FAP model to the evaluation of strategic information technology projects", *International Journal of Enterprise Information Systems*, No. 1, P. 69–90.
6. Turner, J. (2007), *A guide to project-oriented management*, Moscow : Dom Grebennikova, 552 p.
7. Archibald, R. D. (2004), *Management of high-tech programs and projects*, Moscow : DMK Press, 472 p.
8. Burkov, V. N., Novikov, D. A. (1997), *How to manage projects*, Moscow : Sinteg, 188 p.
9. Bushuyev, S., Verenych, O. (2017), "Competencies as an Instrument for the Blended Mental Space Management of a Project", *The 11th International Conference on Project Management (ProMac2017)*, Munich, Germany, P. 850–859.
10. Verenych, O., Bushuyev, S. (2018), "Interaction researching mental spaces of movable context, stakeholder and project manager", *Organization, Technology and Management in Construction: an International Journal*, Vol. 10, Issue 1, P. 1684–1695, DOI: 10.1515/otmcj-2016-0021
11. Phillips, J. J., Bothell, T. W., Snead, G. L. (2003), *The project management scorecards*, Amsterdam : Elseiver, 353 p.
12. Verenych, O., Bushuieva, V. (2017), "The Blended Mental Space as one of the factors for sustainability and success in the project implementation process", *International Research Conference*, Dortmund, Germany, P. 118–125.
13. Molokanova, V. M. (2011), "Investigation of synergetic levels of design-oriented management", *Project management and production development: Coll. Sciences. Ave*., Lugansk : SNU them. Dalia, No. 3, P. 30–37.
14. Verenych, O., Dorosh, M. (2017), "Blended Mental Space: the methodology for creation and approaches for it's management", *Computer Sciences and Information Technologies (CSIT)*, Vol. 2, P. 30–37. DOI: 10.1109/STC-CSIT.2017.8099423
15. Verenich, O. V. (2016), "Management of infrastructure projects and programs as a key element for the development of social and economic systems", *Management of the development of folding systems: zb. Sciences prac*, Kyiv : KNUBA, No. 25, P. 23–31.
16. Yaroshenko, Yu. F. (2013), "Organization development in bifurcation", *Managing the development of complex systems*, Vol. 15, P. 93–97.
17. Bushuyev, S. D., Bushueva, N. S. (2007), "Proactive management of organizational development programs", *Project and program management*, Moscow : SOVNET, No. 4 (12), P. 270–282.
18. Bushueva, N. S. (2007), *Models and methods of proactive management of organizational development programs* : Monograph, Kyiv : Science. light, 200 p.
19. Bushuyev, S., Kozyr, B., Zapryvoda, A. (2019), "Nonlinear strategic management of infrastructure programs", *Innovative Technologies and Scientific Solutions for Industries*, No. 4 (10), P. 14–23. DOI: https://doi.org/10.30837/2522-9818.2019.10.014.

Received 14.02.2020

Відомості про авторів / Сведения об авторах / About the Authors

Бушуєв Денис Антонович – кандидат технічних наук, Київський національний університет будівництва та архітектури, доцент кафедри інформаційних технологій, Київ, Україна; email: BushuyevD@gmail.com; ORCID: https://orcid.org/0000-0001-5340-5165.

Бушуев Денис Антонович – кандидат технических наук, Киевский национальный университет строительства и архитектуры, доцент кафедры информационных технологий, Киев, Украина.

ISSN 2522-9818 (print)
Сучасний стан наукових досліджень та технологій в промисловості. 2020. № 1 (11) *ISSN 2524-2296 (online)*

Bushuiev Denis – PhD (Engineering Sciences), Kiev National University of Construction and Architecture, Associate Professor of the Department of Information Technology, Kyiv, Ukraine.

Козир Борис Юрійович – кандидат технічних наук, Київський національний університет будівництва та архітектури, доцент кафедри управління проектами, Київ, Україна; email: KozyrB@ukr.net; ORCID: https://orcid.org/0000-0003-3400-4571.

Козырь Борис Юрьевич – кандидат технических наук, Киевский национальный университет строительства и архитектуры, доцент кафедры управления проектами, Киев, Украина.

Kozyr Boris – PhD (Engineering Sciences), Kiev National University of Construction and Architecture, Associate Professor of the Department of Information Technology, Kyiv, Ukraine.

ГІБРИДНІ МЕТОДОЛОГІЇ УПРАВЛІННЯ ІНФРАСТРУКТУРНИМИ ПРОЄКТАМИ

Предметом статті є розробка гібридних методологій управління проєктами, програмами і портфелями проєктів. Істотні скорочення життєвих циклів інфраструктурних програм, які містять проєкти різних напрямків діяльності та різними методологіями управління, наприклад "водоспадні" з жорстким життєвим циклом і Agile з гнучким життєвим циклом методології, вимагають використання інструментів конвергенції для формування "гібридних" методологій. **Мета** – розробити конвергентний підхід до побудови гібридних методологій управління проєктами з точки зору процесів прийняття рішень в управлінні проєктами на основі різних платформ. **Результати дослідження** отримані на основі використання конвергентного підходу до побудови методологій управління інфраструктурними проєктами і програмами. Представлена змістовна модель отриманої гібридної методології управління інфраструктурними проєктами і програмами. **Висновки**: Гібридні методології управління інфраструктурними проєктами і програмами стають більш затребуваними в цій категорії програм. Головною причиною є наявність в програмі компонентів з різними життєвими циклами, а, отже, і методологіями, які вимагають інтеграції та гармонізації. Методологію перевірено практикою використання механізмів систем гібридного багаторівневого управління інфраструктурними проєктами та програмами. Дослідження гібридних методологій управління інфраструктурними програмами визначено практикою впровадження різних, за сутністю, компонентів програм. Застосування гібридної методології управління проєктами дозволило авторам виконати різні за сутністю проєкти в обумовлені терміни з заданим бюджетом та якістю будівельних проєктів та проєктів створення інформаційно-комунікаційних систем управління інфраструктурою. Подальші напрямки досліджень пов'язані з детальним опрацюванням механізмів гармонізації, інтеграції, конвергенції та актуалізації.

Ключові слова: конвергенція моделей; гібридні методології управління; інфраструктурна програма; модель взаємодії базових методологій управління проєктами; менеджер програми.

ГИБРИДНЫЕ МЕТОДОЛОГИИ УПРАВЛЕНИЯ ИНФРАСТРУКТУРНЫМИ ПРОЕКТАМИ

Предметом статьи является разработка гибридных методологий управления проектами, программами и портфелями проектов. Существенные сокращения жизненных циклов инфраструктурных программ, которые содержат проекты разных направлений деятельности и разными методологиями управления, например "водопадные" с жестким жизненным циклом и Agile с гибким жизненным циклом методологии, требуют использование инструментов конвергенции для формирования "гибридных" методологий. **Цель** – разработать конвергентный подход к построению гибридных методологий управления проектами с точки зрения процессов принятия решений в управлении проектами на основе различных платформ. **Результаты** исследования получены на основе использования конвергентного подхода к построению методологий управления инфраструктурными проектами и программами. Представлена содержательная модель полученной гибридной методологии управления инфраструктурными проектами и программами. **Выводы**: Гибридные методологии управления инфраструктурными проектами и программами становятся более востребованными в этой категории программ. Главной причиной является наличие в программе компонентов с различными жизненными циклами, а, следовательно, и методологиями, которые требуют интеграции и гармонизации. Методологию проверено практикой использования механизмов систем гибридного многоуровневого управления инфраструктурными проектами и программами. Исследование гибридных методологий управления инфраструктурными программами определен практикой внедрения различных по сути компонентов программ. Применение гибридной методологии управления проектами позволило авторам выполнить различные, по сути, проекты в оговоренные сроки с заданным бюджетом и качеством строительных проектов и проектов создания информационно-коммуникационных систем управления инфраструктурой. Дальнейшие направления исследований связаны с детальной проработкой механизмов гармонизации, интеграции, конвергенции и актуализации.

Ключевые слова: конвергенция моделей; гибридные методологии управления; инфраструктурная программа; модель взаимодействия базовых методологий управления проектами; менеджер программы.

Бібліографічні описи / Bibliographic descriptions

Бушуєв Д. А., Козир Б. Ю. Гібридні методології управління інфраструктурними проектами. *Сучасний стан наукових досліджень та технологій в промисловості*. 2020. № 1 (11). С. 35–43. DOI: https://doi.org/10.30837/2522-9818.2020.11.035.

Bushuiev, D., Kozyr, B. (2020), "Hybrid infrastructure project management methodologies", *Innovative Technologies and Scientific Solutions for Industries*, No. 1 (11), P. 35–43. DOI: https://doi.org/10.30837/2522-9818.2020.11.035.