

PROJECT AND PROGRAM MANAGEMENT

УПРАВЛІННЯ ПРОЕКТАМИ І ПРОГРАМАМИ

UDC 627.2:627.3: 338.28

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CLASSIFICATION OF PROJECTS ON ENERGY SUPPLY SYSTEMS DEVELOPMENT OF PORT INFRASTRUCTURE FACILITIES

Ю.М. Харитонов, Л.С. Чернова. **Класифікація проектів розвитку систем енергопостачання об'єктів портової інфраструктури.** Враховуючи дійсний стан портової інфраструктури показано, що актуальною проблемою, яка потребує свого вирішення, є проблема комплексної модернізації та реконструкції об'єктів портової інфраструктури, в тому числі систем енергопостачання. Одним з напрямків вирішення цієї проблеми слід вважати розробку та впровадження в практику формування і реалізації проектів розвитку систем енергопостачання методів і моделей теорії управління проектами. Ефективне управління проектами розвитку систем енергопостачання об'єктів портової інфраструктури являє собою важливу науково-прикладну проблему, вирішення якої має загальнодержавне значення. Показано, що класифікація проектів дозволяє команді проекту визначати процеси управління, які потребують подальшої розробки та враховувати це при укладанні відповідних договорів на управління проектом. На підставі виконаного дослідження визначені основні класифікаційні ознаки проектів розвитку систем енергопостачання об'єктів портової інфраструктури, що дозволило розробити їх класифікацію.

Ключові слова: порт, портова інфраструктура, управління проектами, класифікація, артефактність, архівація, ознаки проектів

Yu. Kharitonov, L. Chernova. **Classification of projects on energy supply systems development of port infrastructure facilities.** Taking into account the current state of port infrastructure we can state that the problem to be solved is complex modernization and reconstruction of port infrastructure facilities including energy supply systems. One of the directions of this problem solution is the development and introduction into practice of the formation and implementation of energy supply systems development projects the methods and models of project management theory. Efficient management of projects on energy supply systems development of port infrastructure facilities is an important scientific and applied problem and the solution of which is of national importance. It has been shown that the project classification allows the project team to identify those management processes that need further development and take this into account when signing relevant project management contracts. Based on the completed research the main classification features of projects on energy supply systems development of port infrastructure facilities were determined which enabled developing their classification.

Keywords: port, port infrastructure, project management, classification, artifact nature, archiving, project features

Introduction. Under current conditions measures to reform the port industry of Ukraine require their coordination with the processes of world trade globalization while reforms must ensure the predicted efficiency of ports operation in the integrated structure of the economic sectors of the state [1 – 7].

The main factors influencing the port operation efficiency are its geographical location, the existing depth of the port and approach channels, its organizational structure, and so on, while one of the most important factors should be the existing structural and parametric indicators of the port infrastructure facilities (PIF). The functioning efficiency of the port infrastructure, its composition, the level of technical and technological equipment and management determines the functioning stability of transport corridors, the dynamics of ship's sets to the ports of Ukraine, and much more [5, 8].

Formulation of the problem. In accordance with [1], the port infrastructure facilities are movable and immovable facilities that ensure seaport functioning including the water area, hydrotechnical structures, docks, tugs, icebreakers and other port fleet vessels, navigation equipment, and other navigational and hydro graphic facilities of sea routes, systems for controlling the movement of ships, information systems, reloading equipment, railway and automobile access roads, lines of communication, means of heating, gas, water, electricity, other equipment, engineering communications, located within the territory and the water area of the seaport and intended for provision of safety of navigation, provision of ser-

DOI: 10.15276/opu.1.54.2018.12

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vices, state supervision (control) at the seaport. At the same time the port infrastructure facilities of general use include the water area, railway and automobile access roads (to the first branch outside the port territory), lines of communication, facilities of heating, gas, water and electricity, engineering communications, other facilities that provide the activity of two or more business bodies in the seaport.

Taking into account the actual state of the port infrastructure and the genesis of its formation the problem of comprehensive upgrading and rebuilding of PIFs, including energy supply systems, may be considered as an urgent problem that needs to be solved. The existing problem is that the main elements of the supply systems of the port infrastructure facilities have significant physical deterioration according to their technical and technological indicators, modern power supply systems of the port infrastructure do not meet the requirements existing therein, and the resources provision of the given problem solution does not satisfy its needs.

One of the directions of solving this problem is the development and introduction into practice of the formation and implementation of energy supply systems development projects the methods and models of project management theory [9, 10]. Efficient management of development projects of energy supply systems for industrial production is an important scientific and applied problem and the solution of which is of national importance.

Analysis of the recent research and publications. The analysis of publications related to the problems of organization and management of projects of energy supply systems development showed that up to today the separate tasks have been solved in a varying degree concerning solving certain problems related to project management of municipal and industrial power engineering, innovative projects management of modernization of energy-intensive industries enterprises, project management of repair and recovery works in water supply networks, management of innovation platforms of energy-saving technologies projects and so on. Among the directions that ensure effective formation and implementation of project management processes is application of management methods and models that are based on determining the level of project artifact, that is, the existence of known processes for the project team [11]. In general a project can be represented by a function:

$$\Theta_s = f(A_i^j, V_i^j), \quad (1)$$

where A_i^j is an artifact component of a project;

V_i^j is a component of a project that requires development.

Characterisation of A_i^j and V_i^j sets by project stages allowed to propose a well-known classification of projects (Table):

Classification of projects

Artifact project		New project		Project that has a novelty	
Projectstage	A_i^j, V_i^j	Projectstage	A_i^j, V_i^j	Projectstage	A_i^j, V_i^j
Plan	A_i^j	Plan	V_i^j	Plan	A_i^j, V_i^j
Designing	A_i^j	Designing	V_i^j	Designing	A_i^j, V_i^j
Realization	A_i^j	Realization	V_i^j	Realization	A_i^j, V_i^j
Completion	A_i^j	Completion	V_i^j	Completion	A_i^j, V_i^j

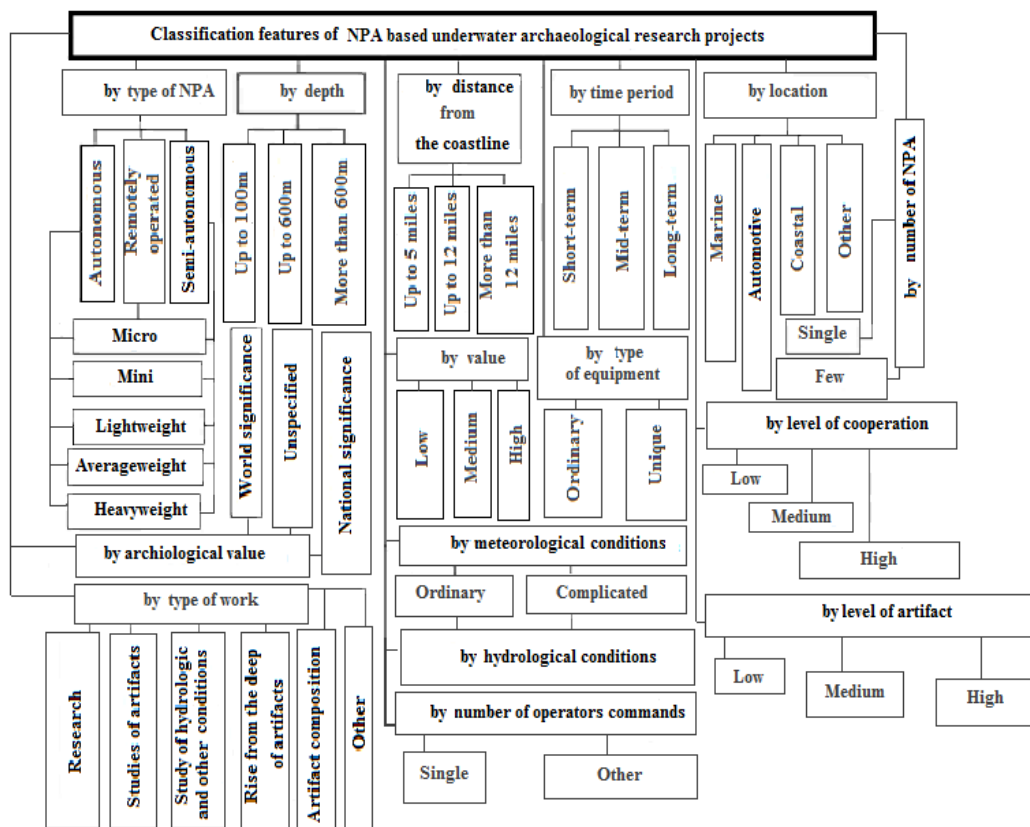
In the Table: an artifact project is a project, which parametric and functional characteristics of elementary components of which are already known and archived according to certain laws;

– a new project is a project, which parametric and functional characteristics of elementary components are not known;

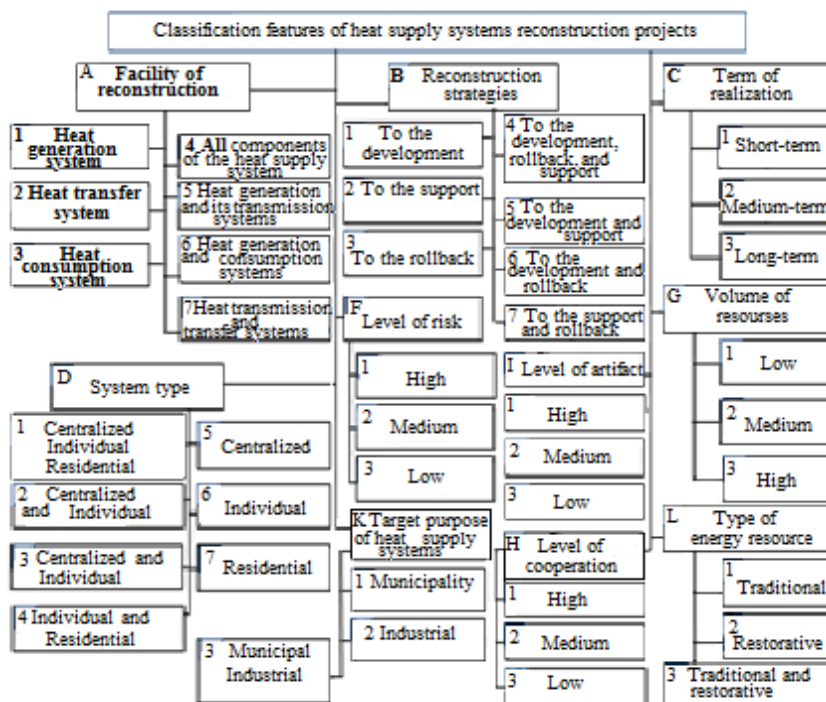
– a project having a novelty is a project that has at least one of the parametric or functional characteristics of elementary components of the project that requires development.

This classification allows to define the basic signs of executed or planned projects in the corresponding subject field of management activity and to perform the classification, and in the future to conduct effective archiving. The implementation of this approach lets the project team to identify management processes that require further development and take this into account at signing relevant

project management contracts. Examples of such classifications (Fig. 1) are classifications of underwater archaeological research projects, projects for the reconstruction of heat supply systems, etc. [12].



a



b

Fig. 1. Examples of classification of underwater archaeological research projects (a) and reconstruction of municipal heat supply systems (b)

However, as the analysis of existing researches on project management has demonstrated there is currently no classification of projects on PIFs power supply systems development.

The aim of the article is to identify classification features and to develop a classification of projects on development of port infrastructure facilities energy supply systems.

Presentation of main material.

There are many approaches to classifying projects that are based on classification features of project product and project subject area, indicators of the project scale and complexity. It can be assumed that for the projects and programs on development of the PIF energy supply systems the indicated features are important, but the features related directly to the subject area will act as the key. In accordance with the fundamental principles of the project management theory as well as the accepted methodology of conducting systematic research,

the developed classification of projects and programs for the development of energy supply systems is based on the principle of compulsory determination of their main properties which, in its turn, requires their identification. The main properties of power supply systems are divided into four groups: structural, development, controllability, functioning (Fig. 2).

The performed analysis [13, 14] allowed to reveal the system properties, which are essential for the developed classification: the feature of system integrity to a greater extent shows itself in centralized and decentralized systems; the target coherence feature represents itself equally in all systems; significant differences in systems are represented in the centralization feature.

It should be noted that more decentralized systems are more dynamic, while the feature of stability is more typical for centralized systems, especially in structural terms. The economic stability of systems depends essentially on the type of energy source, and the feature of flexibility is one of the advantages of a decentralized system.

The most inertial is the centralized system, the feature of adaptability is more and more specified for decentralized systems, they adapt more quickly to changing conditions. The feature of discretion is inherent for decentralized systems. All systems have the feature of anthropogenicity but centralized systems have a longer lifecycle. In assessing the quality and economy, it must be taken into account that decentralized systems can compete with centralized ones provided relatively low cost of energy resources comparing to the cost of energy resources for centralized systems.

The feature of information incompleteness is more usual for centralized systems, since it is difficult to determine its current and expected state, and given its inertia it is needed to make predictions for a longer period. The feature of insufficient certainty of rational decisions is also more characteristic for centralized systems taking into account their greater complexity and the impossibility of creating an accurate mathematical description of such systems. Power supply systems have the feature of multicriteria but centralized systems keeping in mind the large number of subsystems and hierarchical levels may have additional criteria and characteristics, non-specific for other systems. The set of essential characteristics is usually methodically presented by sets of criteria and normative indicators:

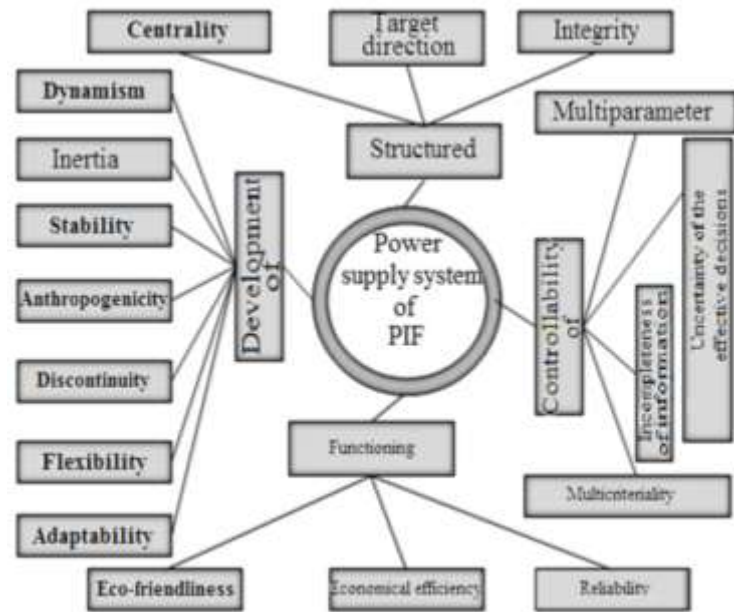


Fig. 2. Main properties of energy supply system of port infrastructure facilities

$$K_k = \{K_0^k, K_i^k, K_{i+1}^k, K_{i+2}^k \dots K_n^k\}, K_n^k \in K_k;$$

$$K_N = \{K_0^N, K_i^N, K_{i+1}^N, K_{i+2}^N \dots K_n^N\}, K_n^N \in K_N,$$
(2)

where K_k is a set of criterion indicators;

K_N is a set of normative indicators.

All systems are multi-parametric but the centralized system has much more parameters than the decentralized one especially at the subsystem level, which complicates the processes of their modeling and search for optimal solutions.

In accordance with the system researches methodology, the features of power supply system's construction, interconnection and interdependence of their characteristics, structures and basic elements were analysed, which are important for management processes of development projects and programs. Since systems co-exist and compete with each other, they were analysed together. A single classification of structural elements, characteristics and parametric indicators was adopted for them.

The conducted research allowed to point out main classification features of projects on the base of which their classification was developed (Fig. 3). The project on energy supply systems development for the PIF is a time-limited action aimed at replacing structural and parametric indicators and characteristics of the system with the set possible limits of the cost of resources, specific organization, requirements for the quality of the results, possessing the properties of uniqueness and value.

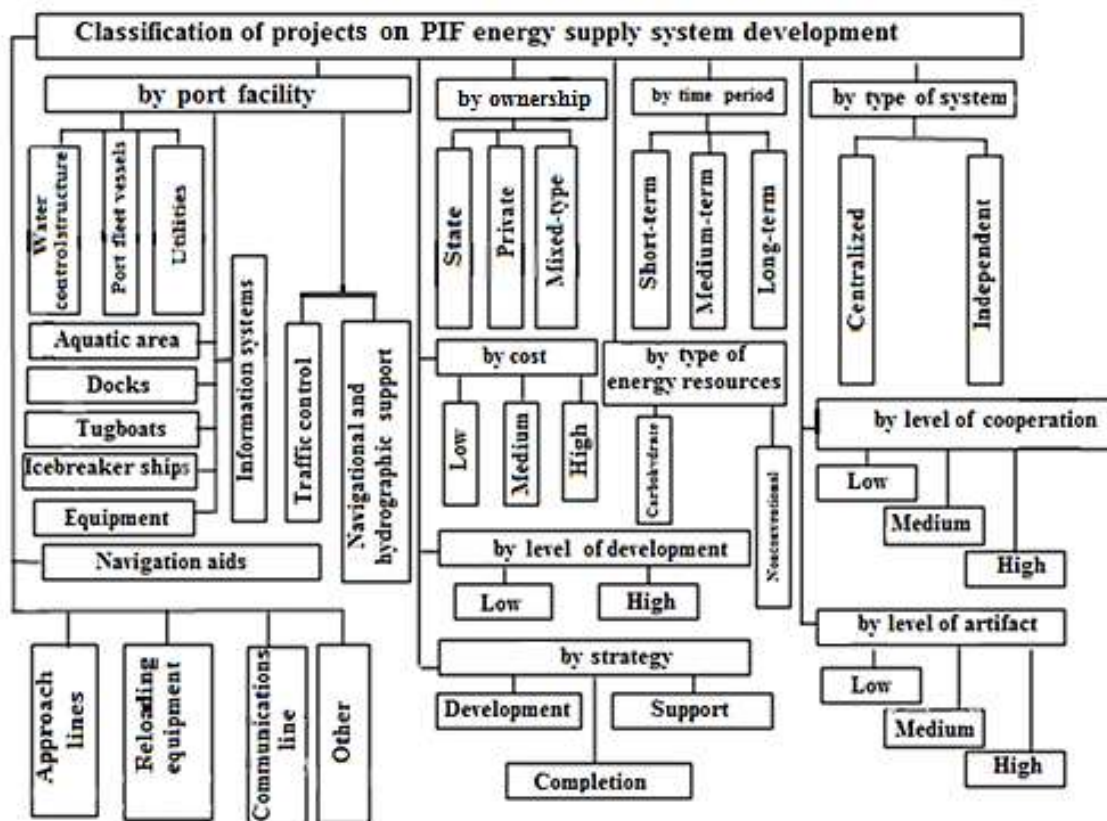


Fig. 3. Classification of projects on PIF energy supply systems development of port infrastructure facilities

Based on the carried out research of possible projects and in accordance with the results of their generalization, as the main classification features that significantly affect the content formation of processes and the group of processes of project management it is proposed to consider the following features: port infrastructure facility, time period, system type, value, energy type, cooperation level, level of risk, level of artifact and development strategy.

When we conduct the classification of projects on energy supply systems development of PIF by the “port infrastructure facility” feature we take into account the probability of projects creation and implementation at all port infrastructure facilities, which were identified in [1]. An important feature of classification of projects on energy supply systems development should be such a feature that characterizes the project from the point of view of energy supply or power consumption system owner such as the ownership: state, private or mixed.

The “time” feature classifies projects as: short-term, medium-term and long-term. Short-term projects include projects which implementation does not exceed six months, medium-term projects, which are executed within one calendar year, and long-term projects, which are carried out in more than one calendar year.

By energy system type the development projects are classified as centralized and individualized. Increasing the requirements for the environmental component of projects allows classifying projects by type of energy resources: projects based on traditional carbohydrate energy carriers and technologies, as well as projects using non-traditional types of energy resources and technologies. By the level of risk projects can be classified as low and high risk projects.

Energy projects can be aimed at increasing the power supply of energy supply system, supporting existing system indicators and their reduction which allows classifying projects focused on “development”, “support”, “completion”.

Such classification features as “cooperation level” and “level of artifact” allow identifying projects that characterize the involvement level of other executers and the development level of management processes and actions.

The identified features and the developed classification are assumed as the basis for the formation of projects on energy supply systems development for port infrastructure facilities and for their archiving.

Conclusions. The main classification features of projects on energy supply system development of port infrastructure facilities are identified, which are the following: port infrastructure facility, ownership, time, cost, type of energy resource, type of system, risk level, strategy, cooperation level and the level of artifact.

The proposed and substantiated classification features allow us to classify projects on energy supply systems development of port infrastructure facilities, to form their substantial components and also to implement archival processes effectively.

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Received March 02, 2018

Accepted April 05, 2018