



PECULIARITIES OF IMPLEMENTATION OF CONFIGURATION CONTROL PROCESSES OF INTEGRATED AND INNOVATIVE PROJECTS OF LOGISTICS SYSTEM CREATION

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ABSTRACT

In our study it is established that the existing models and methods cannot be used to control the configuration of integrated projects for the creation of logistics systems. The known toolkit provides general approaches to controlling the configuration of projects and does not take into account many factors of the design environment, which determine changes in the configuration of integrated projects for creating logistics systems. It has been substantiated that changes in the configuration of integrated projects for the creation of logistics systems are due to two groups of factors. They can be assessed by four criteria based on the determination of two generalized



evaluative characteristics of the influence of the factors of the design environment on changes in the configuration objects of these projects. The scientific and methodological foundations of the configuration control of integrated projects for the creation of logistics systems are proposed, taking into account the changing components of their design environment. To control the configuration of integrated projects for the creation of logistics systems, the use of project management theory and system-factor principles is envisaged, which fully take into account the peculiarities of the implementation of these projects. Based on the proposed model, the impact of internal environment factors of integrated projects for the creation of logistics systems on changes in the configuration object No. 4.1 (a specialized tank truck for transporting perishable goods) was assessed. Significance coefficients are defined for each of the assigned codes (evaluation criteria and factors that determine the configuration changes) of the configuration objects of integrated projects for the creation of logistics systems. Their numerical value is in the range 0...1 and it characterizes the significance of each of the factors for a particular object of the configuration of integrated projects for the creation of logistics systems. Quantitative assessment of the impact of design environment factors on changes in the configuration of integrated projects for the creation of logistics systems is carried out on a 100-point scale.

Keywords: Integrated; Innovative; Projects; Management; Configuration; Control; Logistics Systems

1. INTRODUCTION

Currently, in the world and Ukraine, there is a problem of creating efficient logistics systems that are integrated (ANSI/EIA649, 1998; Bashynsky, 2019).

Their creation requires the implementation of projects, effective management of which is impossible without configuration management. This indicates that the solution of existing management tasks for the creation of effective integrated logistics systems requires the implementation of several projects (procurement of raw materials, transportation of raw materials, storage of raw materials, production of finished products, storage of finished products, etc.), which are integrated. It is impossible to achieve the effectiveness of the implementation of each of the projects for the creation of integrated logistics systems, without their systemic management. An integral part of the implementation of these projects is their configuration management (Practice Standard for Project Configuration Management 2007); Ratushny et al., 2018).



To manage the configuration of projects for the creation of integrated logistics systems certain management processes should be performed, among which control processes are important. Changing components of the project environment have a significant impact on the configuration of projects for creating integrated logistics systems. These components act as limiting factors in the justification of the parameters of logistics systems. At the same time, there is a need to use tools for managing the configuration of integrated projects for creating logistics systems, which involves taking into account their specific project environment (Pavlikha et al., 2019).

To do this, it is necessary to substantiate the scientific and methodological principles that underlie the implementation of control processes for the configuration of integrated projects for the creation of logistics systems.

1. LITERATURE REVIEW

It is known that the effectiveness of any project, including projects to create integrated logistics systems, is largely due to the availability and use of management tools that take into account the characteristics of these projects and their specific design environment (Kolodiichuk, 2016).

Several scientific works are devoted to solving managerial problems of project configuration management and the impact of the project environment on it (Ratushnyi et al., 2019) as well as international standards.

Well-known papers Sumets (2017) concern the analysis of the possibility of using the configuration management tools of projects of different applied branches. The models and methods proposed there involve the use of traditional approaches, that do not take into account the features of integrated projects to create logistics systems.

Certain scientific works Bashynsky (2019) are devoted to the solution of management problems in projects for the creation of integrated systems, which are based on their forecasting and control processes. Their main advantages are taking into account the specifics of the subject area. However, it is impossible to use them while managing the configuration of integrated projects for logistics systems creation, as they do not take into account the specifics of the subject area and the impact of components of the project environment on management processes and configuration of relevant projects (Ratushny, Bashynsky & Ptashnyk, 2019).

When implementing integrated projects for the creation of logistics systems, their configuration should be controlled. This control is carried out during the life cycle of projects. According to current international standards Bashynsky (2019), all configuration objects must be monitored to ensure that the configuration complies with documented requirements, indicators, and characteristics (Boyarchuk, et al., 2019).

However, this document provides general approaches to project configuration control. These approaches do not make it possible to control the configuration components of integrated projects for the creation of logistics systems.

They do not provide any control over documented requirements, indicators and characteristics. So, there is a need for the development of scientific and methodological foundations for controlling the configuration of integrated projects for the creation of logistics systems.

The developed scientific and methodological foundations eliminate the shortcomings of the existing ones. They are based on the theory of project configuration management and system-factor principles (Hulida, et al., 2019).

The formulated management problem is solved in the article, which confirms its scientific and practical value.

The research aims to substantiate the scientific and methodological foundations for controlling the configuration of integrated projects for creating logistics systems, taking into account the changing components of their project environment. To achieve this aim, it is necessary to solve the following tasks:

- to propose a scientific and methodological basis for controlling the configuration of integrated projects for the creation of logistics systems, taking into account the changing components of their project environment;
- substantiate a configuration control model for integrated projects of logistics systems creation.

2. MATERIALS AND METHODS

Configuration control of integrated logistics systems projects is the process of applying administrative and technical procedures at each stage of the life cycle of these projects to ensure compliance with the configuration with documented requirements, indicators, and characteristics (Boyarchuk, et al., 2019). This process involves managing the

changes that are made to the configuration objects after justifying the basic configuration of the integrated logistics projects (Vann, 1996).

There are four types of configurations within integrated projects for the creation of logistics systems, namely: functional configuration (FC); design configuration (DC); design basic configuration (DBC); physical configuration (PC). Each of them characterizes the completion of the stages of the life cycle of individual projects that are integrated Figure 1 (Tryhuba et al., (2020).

After identifying the configuration of projects, their changes should be monitored. Changes in the configuration of integrated projects for the creation of logistics systems are due to several factors. All factors that cause changes in the configuration of these projects can be conditionally divided into two groups: external and internal Figure 2 (Tryhuba et al., 2021).

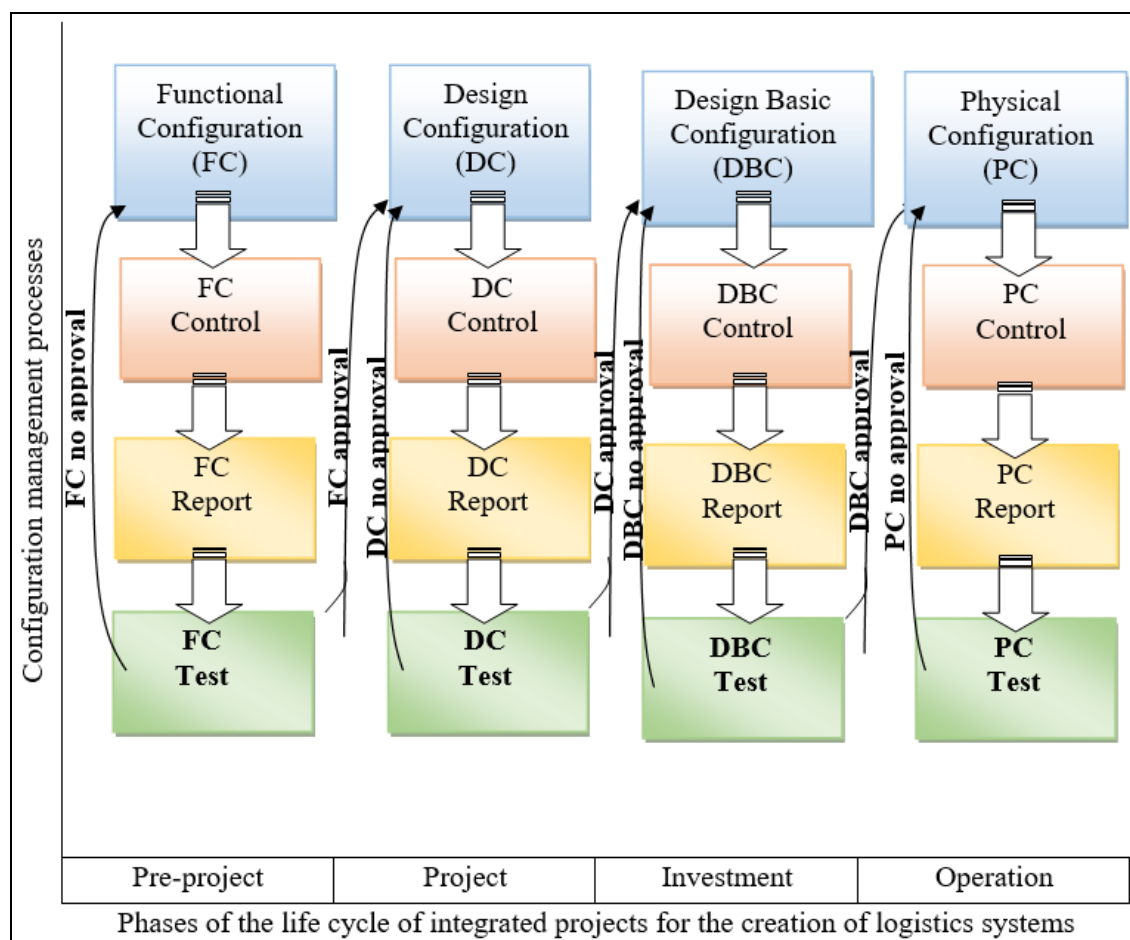


Figure 1: Scheme of configuration management of integrated projects for the creation of logistics systems

Source: compiled by the authors

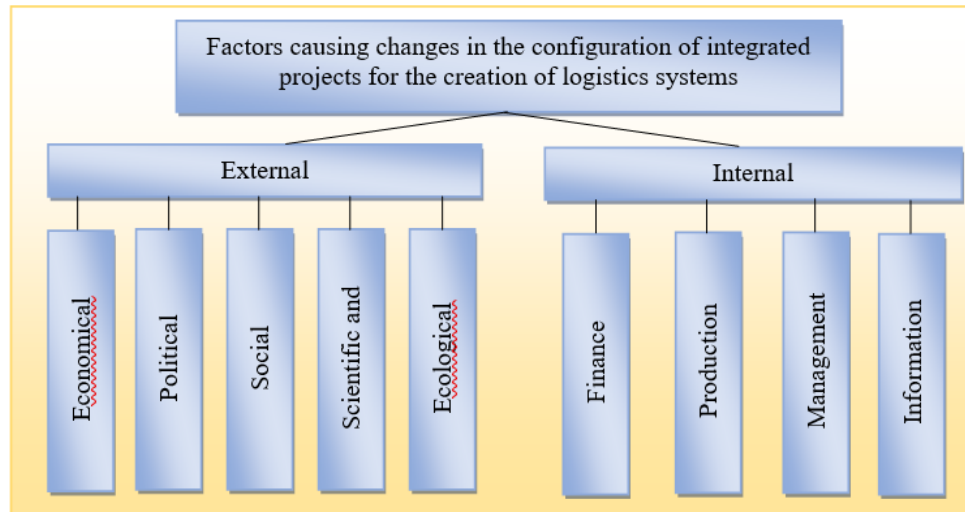


Figure 2: Factors causing changes in the configuration of integrated projects for the creation of logistics systems

Source: compiled by the authors

External factors include the following groups:

- economic (*Ec*),
- political (*Pl*),
- social (*Sc*),
- scientific and technical (*St*),
- ecological (*El*).

Economic factors include the level and rate of inflation, fluctuations in the exchange rate of the national currency against the currencies of other countries, taxation, conditions for obtaining a loan and the bank interest rate, the level of prices for dairy products. For example, an increase in energy prices causes an increase in prices for storage and all types of products obtained, and especially those in the logistics of which most of the energy costs are spent (Rudynets et al., 2019).

The political group of factors characterizes the stability both in the state and in the territory of implementation of integrated projects for the creation of logistics systems. The influence of political factors on the configuration of a particular project is particularly noticeable in an unstable socio-economic and political environment. The unstable political situation causes an outflow of capital from projects that require significant long-term investment and affect relations with foreign partners.

A social group of factors is formed within a particular region and reflects the views, values, and preferences of people, which affects the sale of finished products obtained from

logistics systems. Besides, the deliberate disregard of the requirements of the current legislation for the implementation of integrated projects for the creation of logistics systems leads to deviations in the indicators of the documented configuration (Syrotiuk et al., 2020).

Scientific and technical factors influencing changes in the configuration of integrated projects for creating logistics systems include discoveries, inventions that make it possible to reduce the cost of procurement of raw materials, transportation of raw materials, storage of raw materials, production of finished products, and storage of finished products without changing its quality. This indicates that the control center of integrated projects for the creation of logistics systems should analyze the possible impact of scientific and technological progress on the effectiveness of these projects, and accordingly on changes in their configuration (Tryhuba et al., 2019).

The ecological group of factors includes more than normalized emissions of pollutants and toxic substances into the environment; the size of possible irreversible negative consequences, etc.

External factors influencing changes in the configuration of integrated projects for the creation of logistics systems are characterized by a high level of variability, uncertainty, and unpredictability.

The internal factors that cause changes in the configuration of individual integrated projects for the creation of logistics systems include finance (Fn), production (Pr), management (Mn), and information (If). The financial insolvency of a particular project requires changes in the documents regarding its configuration. These changes involve replacing the proposed configuration objects with cheaper ones or changing their number, which will make the project cheaper. Regarding production factors, they should include:

- 1) variability of the characteristics of the design environment (territorial location of logistics facilities and volumes of raw materials and finished products for which logistics systems are designed, etc.);
- 2) changes in the range of products, which causes changes in the quality requirements of raw materials, and, accordingly, changes in the time functional indicators of the objects of the configuration of logistics systems.

The management group of factors includes the objectivity of the identification of the configuration of a particular project to create a logistics system and the reliability of individual decisions regarding its changes. Besides, the management group of factors is

characterized by the forms of organization of activities for the implementation of projects and the distribution of responsibilities between project participants, which significantly affect the functional performance of the configuration objects (Sokulskyi et al., 2020).

The effectiveness of decision-making on changes in the configuration of integrated projects for the creation of logistics systems is largely influenced by the information group of factors, which is characterized by the timeliness and completeness of the information obtained about the project environment.

We propose a model for monitoring changes in the configuration of integrated projects for the creation of logistics systems (Figure 3).

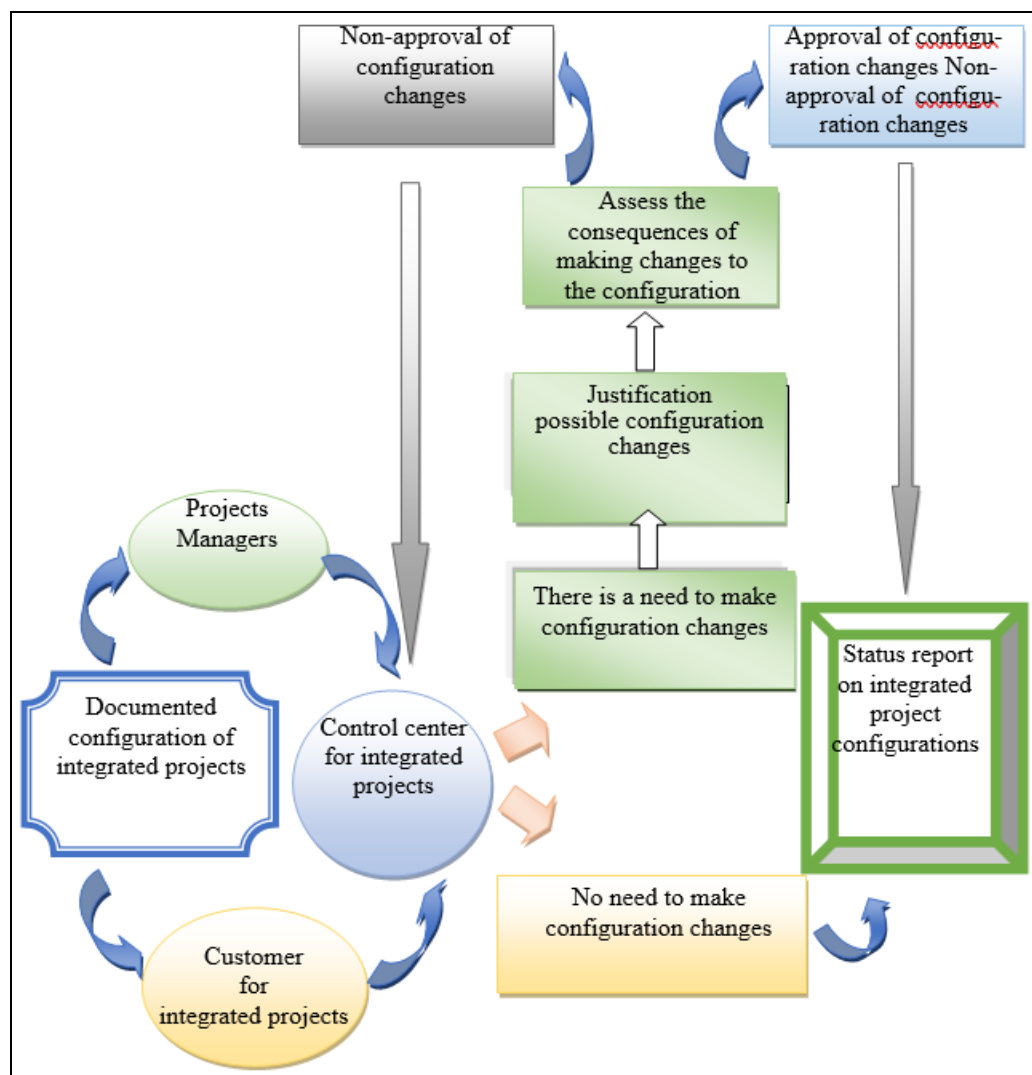


Figure 3: Model of the execution of the configuration control process of integrated projects for the creation of logistics systems

Source: compiled by the authors

It assumes that the management process is carried out both by the customer or investor of these projects and by the team that implements these projects. They analyze

documented configuration objects and their performance, changes in the design environment, and the factors that cause these changes (Tryhuba et al., 2018).

The results of the analysis are submitted to the meeting of the management center of integrated projects for the creation of logistics systems. The Center for Management of Integrated Projects for the Creation of Logistics Systems approves decisions on the expediency of the need to make changes to the configuration of these projects, or their absence.

If there is a need for changes in the configuration of integrated projects for the creation of logistics systems, then a justification of possible options for its changes and the consequences of them is carried out. If there is such a configuration option for integrated projects for the creation of logistics systems, in which it is possible to significantly increase the efficiency of their implementation, the changes made are approved and a report on the configuration status of these projects is carried out. If the changes made to the configuration of integrated projects for the creation of logistics systems are not approved, the control center reconsiders the need to make changes to it (Tryhuba et al., 2020).

The following criteria are used to control changes in the configuration of integrated projects for the creation of logistics systems:

- functionality (F);
- reliability (R);
- efficiency (E);
- mobility (M).

Functionality (F) is the ability of a configuration object to meet current requirements for the functions assigned to it. Reliability (R) is the ability of a configuration object to keep the values of all its parameters within a set time interval.

Efficiency (E) - is assessed by the indicators of the configuration objects of a particular project to create logistics systems, which reflect the ratio of benefits (values) to the cost of their implementation.

Mobility (M) is the ability of the object of the configuration of a particular project to create logistics systems to move territorially within the internal environment of the project. Each of the configuration objects is assigned a code depending on the evaluation criterion and the factor that determines the configuration changes of integrated projects for the creation of logistics systems (Figure 4).



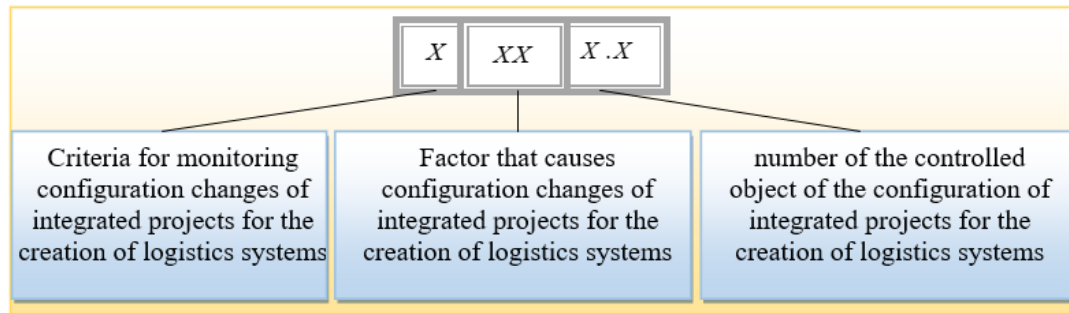


Figure: 4: Coding of configuration objects of integrated projects for the creation of logistics systems to perform the process of their control
 Source: compiled by the authors

After assigning evaluation codes to configuration objects regarding the influence of design environment factors on changes in the configuration of integrated projects for the creation of logistics systems, evaluation tables are developed, which contain assigned evaluation codes of configuration objects of individual projects, methods for evaluating changes and their quantitative value Table 1 (Tryhuba et al., 2020).

Table 1: Example of assessment of the impact of internal factors of integrated projects for the creation of logistics systems on changes in the configuration object No. 4.1 (specialized tank truck for transportation of perishable goods)

No.	Assigned code	Evaluation method	Evaluation indicator θ_{oi} , points	Significance coefficient, k_{ζ}^3
1	<i>FFn4.1</i>	Expert	6	0,022
2	<i>FFn4.1</i>	Expert	3	0,03
3	<i>EFn4.1</i>	Expert	1	0,035
4	<i>MFn4.1</i>	Expert	30	0,02
5	<i>FPr4.1</i>	Simulation	2	0,01
6	<i>RPr4.1</i>	Expert	4	0,01
7	<i>EPr4.1</i>	Simulation and calculation	1	0,025
8	<i>MPr4.1</i>	Expert	6	0,02
9	<i>FOr4.1</i>	Expert	5	0,06
10	<i>ROr4.1</i>	Expert	3	0,15
11	<i>EOr4.1</i>	Simulation and calculation	15	0,031
12	<i>MOr4.1</i>	Expert	6	0,045
13	<i>FMn4.1</i>	Expert	2	0,06
14	<i>RMn4.1</i>	Expert	3	0,01
15	<i>EMn4.1</i>	Expert	1	0,036
16	<i>MMn4.1</i>	Expert	1	0,02
17	<i>FIf4.1</i>	Expert	2	0,3
18	<i>RIf4.1</i>	Expert	4	0,01
19	<i>EIf4.1</i>	Expert	3	0,026
20	<i>MIf4.1</i>	Expert	2	0,08

For each of the assigned codes (evaluation criteria and factors that determine the configuration changes) of the configuration objects of integrated projects for the creation of logistics systems, the significance coefficient is substantiated. (k_{si}^m).

The numerical value of the coefficient k_{ci}^m is in the range from 0 to 1 and it characterizes the significance of each of the m factors on the $-th$ object of the configuration of integrated projects for the creation of logistics systems. Quantitative assessment of the impact of design environment factors on changes in the configuration of integrated projects for the creation of logistics systems is carried out on a 100-point scale.

The next step is to determine the generalized assessment characteristics of the impact of design environment factors on changes in the configuration of integrated projects for the creation of logistics systems. These include absolute (P_n) and relative (K_n) indicators of the impact of design environment factors on changes n object of configuration of integrated projects for logistics systems creation.

The absolute indicator (P_n) of the influence of design environment factors on changes in the configuration objects of integrated projects for the creation of logistics systems is determined by the formula

$$P_n = \sum_{i=1}^m (\theta_{oi}^j \cdot k_{3i}^j), \quad (1)$$

where θ_{oi}^j – an estimated indicator of the influence of i factor of the project environment according to the j criterion on changing the configuration objects of integrated projects for the creation of logistics systems, points; k_{3i}^j – the coefficient of the significance of the influence of i factor of the project environment according to j criterion on changing the configuration objects of integrated projects for the creation of logistics systems.

The relative indicator (K_n) of the influence of design environment factors on changes in the configuration objects of integrated projects for the creation of logistics systems is

$$\text{determined by the formula } K_n = \sum_{i=1}^m \left(\frac{\theta_{oi}^j}{\theta_{\text{basi}}^j} \cdot k_{3i}^j \right), \quad (2)$$

where θ_{basi}^j – baseline impact score of i factor of the project environment due to j criterion for changes in the configuration objects of integrated projects for the creation of logistics systems, points.

Based on the configuration control of integrated projects for the creation of logistics systems, a report on the effectiveness of the configuration is carried out and its verification is

performed. If, as a result of the identified check, it is established that the configuration does not meet the requirements for it, then it should be returned to the process of its identification. Identification is performed based on well-known algorithms, methods, and models that are presented in scientific papers (ANSI/EIA649, 1998; Bashynsky, 2019; Islam & Mandal, 2017).

Therefore, the proposed scientific and methodological principles of configuration control of integrated projects for the creation of logistics systems indicate the possibility of using them during the implementation of these projects to ensure compliance of the documented configuration with requirements, indicators, and characteristics taking into account the changing design environment.

3. CONCLUSIONS

The analysis of the current scientific and methodological principles of project management shows that they cannot be used to control the configuration of integrated projects to create logistics systems, as they provide common approaches to controlling project configuration and do not take into account many factors of the project environment.

It is substantiated that changes in the configuration of integrated projects of logistics systems are caused by two groups of factors, which are evaluated by four criteria based on the definition of two generalized evaluation characteristics of the impact of design environment factors on configuration changes of these projects.

The proposed scientific and methodological principles of control of the configuration of integrated projects of logistics systems, taking into account the changing components of their design environment are based on project management theory and system-factor principles and fully take into account the implementation of integrated projects of logistics systems and can be used to control their configuration.

Further research on the configuration control of integrated projects for the creation of logistics systems should be conducted to establish the quantitative value of the planned targets of the generalized assessment of the impact of design environment factors on changes in the configuration of these projects.

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