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APPLYING A CONTINGENCY APPROACH TO PROJECT MANAGEMENT WITHIN MESO-LEVEL PUBLIC-PRIVATE PARTNERSHIPS

This paper investigates the application of a contingency approach to managing meso-level public-private partnership projects. It is argued that situational management in implementing public-private partnership projects should rely on the so-called risk-contributing factors. It is emphasized that the contingency approach in the context of public-private partnerships is based on developing a set of indicators and integral index calculation used to rank both the projects themselves and their application in terms of territorial and sectoral aspects. It is proved that the integral coefficient at the meso-level reflects the most favorable environment for doing business, including basic frameworks for realization of public-private partnership projects. According to the calculations carried out within this study, at the regional level by selected indicators, the Mykolayiv region has demonstrated the most favorable conditions. Accordingly, the Donetsk region has the highest level of transaction costs and the highest rate of project implementation risk, i. e. the absolute risk value makes up 0.482. The high risk index for this region stems from military activities, low infrastructure development, lack of sufficient production capacity and, consequently, significant commercial and administrative costs for current operations. Thus, it is concluded that the assessment and multilevel analysis based on integral indicators, absolute and relative risk indicators are sufficient for the optimal selection of public-private partnership projects upon the criterion "the lowest project implementation risk – the greatest effects in different areas of activity.

Keywords: *project risk management; public-private partnership projects; multiple correlation; integral coefficients; transaction costs.*

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ВИКОРИСТАННЯ СИТУАЦІЙНОГО ПІДХОДУ ПРИ УПРАВЛІННІ ПРОЕКТАМИ ДЕРЖАВНО-ПРИВАТНОГО ПАРТНЕРСТВА НА МЕЗОРІВНІ

У статті досліджено застосування ситуаційного підходу в управлінні проектами державно-приватного партнерства на мезорівні. Аргументовано, що ситуаційний менеджмент при реалізації проектів державно-приватного партнерства має враховувати наявність так званих ризикоутворюючих факторів. Акцентовано, що ситуаційний підхід у контексті імплементації проектів державно-приватного партнерства базується на формуванні групи показників та розрахунку інтегрального показника, який використовується для ранжирування як самих проектів, так і їх застосування з погляду територіального та галузевого аспектів. Доведено, що інтегральний коефіцієнт на мезорівні відображає найбільш сприятливі базові умови ведення бізнесу, в тому числі умови реалізації проектів державно-приватного партнерства. За проведеними розрахунками в цій статті визначено, що найбільш сприятливий клімат з позиції обраних показників на регіональному рівні сформовано в Миколаївській області. Відповідно, з найвищим рівнем трансакційних витрат і з найвищим ризиком реалізації проектів є Донецька область – значення абсолютного ризику становить 0,482. Високий індекс ризику для цього регіону обумовлений проведенням військових дій, низьким рівнем розвитку інфраструктури, відсутністю достатніх виробничих потужностей і, як наслідок, значними комерційними та адміністративними витратами на ведення поточної діяльності. Відтак, резюмовано, що оцінка та багаторівневий аналіз на основі

інтегральних показників, абсолютних та відносних показників ризику є достатніми для оптимального вибору проектів державно-приватного партнерства за критерієм «найменші ризики реалізації проекту – найбільші ефекти в різних сферах діяльності».

Ключові слова: *управління проектними ризиками; проекти державно-приватного партнерства; множинна кореляція; інтегральні коефіцієнти; трансакційні витрати.*

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ИСПОЛЬЗОВАНИЕ СИТУАЦИОННОГО ПОДХОДА ПРИ УПРАВЛЕНИИ ПРОЕКТАМИ ГОСУДАРСТВЕННО-ЧАСТНОГО ПАРТНЁРСТВА НА МЕЗОУРОВНЕ

В статье исследовано применение ситуационного подхода в управлении проектами государственно-частного партнерства на мезоуровне. Аргументировано, что ситуационный менеджмент при реализации проектов государственно-частного партнерства должен учитывать наличие так называемых рискообразующих факторов. Акцентировано, что ситуационный подход в контексте имплементации проектов государственно-частного партнерства базируется на формировании группы показателей и расчёта интегрального показателя, который используется для ранжирования как самих проектов, так и их применения с точки зрения территориального и отраслевого аспектов. Доказано, что интегральный коэффициент на мезоуровне отражает наиболее благоприятные базовые условия ведения бизнеса, в том числе условия реализации проектов государственно-частного партнерства. По проведённым расчетам в данной статье определено, что наиболее благоприятный климат с позиции избранных показателей на региональном уровне сформирован в Николаевской области. Соответственно, с высоким уровнем трансакционных издержек и с высоким риском реализации проекта является Донецкая область – значение абсолютного риска составляет 0,482. Высокий индекс риска для этого региона обусловлен проведением военных действий, низким уровнем развития инфраструктуры, отсутствием достаточных производственных мощностей и, как следствие, значительными коммерческими и административными расходами на ведение текущей деятельности. Таким образом, резюмировано, что оценка и многоуровневый анализ на основе интегральных показателей, абсолютных и относительных показателей риска являются достаточными для оптимального выбора проектов государственно-частного партнерства по критерию «наименьшие риски реализации проекта – самые значительные эффекты в различных сферах деятельности».

Ключевые слова*: управление проектными рисками; проекты государственно-частного партнерства; множественная корреляция; интегральные коэффициенты; трансакционные издержки.*

Problem statement. In managing a portfolio of projects, the government manages a portfolio of public-private partnership (PPP) projects. An important component in determining priority projects for implementation is the selection of the most rational places for their application. To solve this problem, in our opinion, it is advisable to use an situational approach that combines various procedures into a universal set of methods and methods for generating changes in control systems depending on changes in parameters of the control object, as well as the appearance of exogenous factors.

Analysis of recent research and publications. Many foreign and national scientists, like N.G. Dumont [4], J. Delmon [3], L. Ganuschak-Efimenko [2] and many others, have devoted their attention to issues related to the management of PPP projects. Some scientists in the field of project

management, in particular, N.G. Dumont [4, p. 96], they propose to consider the management of PPP projects using an situational approach, which became the basis for writing this article.

Highlight previously unsolved aspects of the problem. After analyzing the research of scientists on this issue, we propose to consider projects using an situational approach, in order to highlight the most pleasant and, accordingly, unfavorable regions of Ukraine for running public-private projects.

The purpose of the article. The main goal of this work is is to investigate the application of the situational approach in the management of public-private partnership projects

Presentation of the main research material. The situational approach implies the observance of a number of general conceptual principles [4]. The basic principles of situational control systems are:

1. The principle of feedback. With the help of feedback, measurement of the characteristics of the object being monitored takes place, reactions are produced as control actions.

2. The principle of multi-level. It is assumed that the situational control system consists of a number of subsystems.

3. The principle of the required diversity. According to this principle, the diversity of the control system must be no less than the diversity of the control object.

Unlike situational, other ("non-situational") control systems should include a small number of objects to maintain the ability to control an object. Situational systems imply the absence of a certain stationary control law for elements of a given class. The more varied the process of functioning of the system, the more its parameters and structures must change.

4. The principle of openness. Compliance with this principle determines all internal processes in an situational control system. The openness of the system implies that various resources can move freely through it and through it; the system perceives exogenous factors and responds through endogenous factors.

5. The principle of dual control. Control effects are dual in nature: on the one hand, they are designed to control the object, and on the other – to serve as a basis for studying its properties and patterns for subsequent control actions. In other words, the structure of control actions must change in accordance with changes in the parameters of the system of the control object.

However, we point out that situational management in the procedures for selecting PPP projects [4, p. 176–180] should take into account the presence of the so-called risk-forming elements. In this context, the mandatory characteristics and, at the same time, the requirements for the procedures for selecting PPP projects are:

- forecast and analytical nature;
- the prevalence of strategic functions;
- economic and mathematical modeling;
- variance;
- probability.

These characteristics, being peculiar risk-management parameters in the situational portfolio management system of PPP projects, do not differ from the classical parameters that are taken into account when developing the risk profile of any other investment project, to substantiate the effectiveness of which are mainly used methods and tools of economic and mathematical simulation methods, but not qualitative methods, since they cannot fully measure the risks of project implementation with appropriate accuracy and reliably stew.

Further, an adequate risk assessment in the management of a portfolio of PPP projects allows one to identify inefficient projects as carrying potentially large risks, including for infrastructure participants. These are projects that do not fulfill the tasks assigned to them, and also do not allow to obtain the expected both commercial and social effects when using them. From this

point of view, the use of an situational system transforms classical economic-mathematical modeling into agent-oriented [3, 4].

The principal feature of this approach is the perception of the modeled system as a set of autonomous agents that make independent, independent decisions.

Based on the above principles of building situational management systems and the provisions of agent-based modeling, the authors developed an situational approach to the procedure for selecting public-private partnership projects, taking into account not only the differentiated multi-level procedures, but also regional aspects of PPP projects.

This approach includes 7 main blocks of analysis:

- basic conditions for implementation;
- parameters of the project risk efficiency;
- project risk function;
- social effects of implementation;
- commercial effects of implementation;
- budgetary effects of implementation;
- economic effects of implementation.

At the first stage, each direction is assessed and analyzed separately, only after carrying out a full analysis; within the framework of the second stage, these areas are estimated as a whole.

The direction of the assessment of infrastructure and multiplicative effects, reflecting the impact of the project on other sectors of the economy, social activities both in this region and adjacent to it, is isolated. The role of the infrastructure effect is to determine the level of change.

The state of the infrastructure in the immediate location of the project, as well as the degree of its influence on other areas of activity and management. In accordance with the above, a definition of the concept of “infrastructure effect” can be given.

An infrastructure effect is an effect that manifests itself in a change in the state of the infrastructure in a region, which creates a greater economic or commercial effect when implementing projects in combination, rather than creating projects that are not aimed at general multiplicative results of activities.

The economic nature of the infrastructure effect is identical to the nature of the multiplicative one; however, the first affects only certain areas of the implementation of public-private partnership projects and represents private externalities for project implementation.

An situational approach to the procedure for selecting projects of a public-private partnership is based on the formation of a panel of indicators and the calculation of the integral indicator, which is used to rank both the projects themselves and their application in terms of territorial and sectoral aspects.

To form a panel of indicators, it is advisable to use indicators that sufficiently reflect the conditions for the implementation of projects. The general logic of calculating the integral indicator, determining the coefficients for an integral indicator is represented by a system of formulas (1)–(2), which reflects the multilevel calculation and the universality of the approach to the selection of public-private partnership projects, as well as various factors that can have a significant impact on the final calculation integral index.

To calculate the integral indicator, it is necessary to carry out a number of preliminary calculations and actions:

1) determine the level of assessment;
2) to form a panel of indicators;
3) calculate the normalized coefficients;
4) make a final calculation of the integral indicator;
5) rank the results of the assessment level;

6) rank the results of all levels (building a polygon of ranks). At the third and fourth stages it is necessary:

1) calculate the normalized coefficients for each indicator in the indicator panel:

$$N_i = \frac{1}{max_i - min_i}, \quad (1)$$

where *Ni* is the normalized coefficient of he *i-th* indicator;
maxi – maximum value *i-th* indicator;
mini – the minimum value of the *i-th* indicator.

2) calculate the integral indicator in general for the selected level:

$$M_j = \sum_{i=1}^{n} Fi * Ni, \quad (2)$$

where the *Mj* level of assessment is an integral indicator of the *j-th* level of assessment;
Fi is the actual value of the *i-th* indicator;
Ni is the normalized coefficient of the *i*-th indicator.

The described approach to the calculation allows you to build an independent assessment of indicators from the point of view that the indicators are not established weights; each indicator is estimated separately, while the integral indicator takes into account equally the change of each.

For approbation of the described approach, one level can be considered as an example of calculations – regional conditions for the implementation of projects, including projects of public-private partnership.

To form a dashboard, financial ratios were chosen that characterize the economic conditions for the regions of the country. The choice of financial ratios and financial indicators occurred in several stages. The hypothesis of choosing representative indicators was based on checking the cross-influence of each (multiple correlation) with a dependency level of no more than 85%.

On the basis of this hypothesis, for each subject of Ukraine, 10 indicators were selected, compiled on the basis of consolidating the data of reports of enterprises and organizations for all types of economic activity for January – December 2018 [6]:

- return on sales, %;
- return on equity, %;
- ratio of borrowed and own capital, times;
- security with own working capital, %;
- capital productivity (turnover of fixed assets), times;
- share of equity in total capital (autonomy ratio);
- current liquidity (total coverage), times;
- fast liquidity (intermediate coverage), times;
- absolute (immediate, instantaneous) liquidity, times;
- asset turnover, times.

Testing these values under the hypothesis did not exclude any indicator from the selected ones. The results of multiple correlation are presented in Table 1.

The results of multiple correlation indicate that a number of indicators are inversely related: return on sales and capital productivity, return on equity and autonomy ratio, the ratio of equity and land capital and asset turnover, capital productivity and fast liquidity, etc. This is due to differences in the calculation of coefficients and data usage. However, according to the results of multiple correlation, the inverse relationship does not exceed 20%.

The next stage of approbation is the calculation of normalized coefficients for each indicator (indicator) – financial ratio (Table 2).

Using the obtained normalized coefficients and the available actual data allows to calculate the integral indicator.

Table 1

Multiple correlation of financial ratios by subjects of Ukraine for January – October 2018

	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
K1	1,000									
K2	0,928	1,000								
K3	0,403	0,509	1,000							
K4	0,144	0,153	0,241	1,000						
K5	0,194	0,040	0,036	0,556	1,000					
K6	0,398	0,150	0,746	0,512	0,171	1,000				
K7	0,518	0,246	0,572	0,355	0,025	0,435	1,000			
K8	0,147	0,274	0,654	0,229	0,464	0,451	0,829	1,000		
K9	0,435	0,179	0,732	0,548	0,183	0,667	0,614	0,681	1,000	
K10	0,231	0,040	0,127	0,453	0,807	0,455	0,257	0,201	0,057	1,000

where: K1 – profitability of sales, %; K2 – return on equity, %; K3 – the ratio of own and borrowed capital, times; K4 – provision with own working capital, %; K5 – capital productivity (turnover of fixed assets), times; K6 – the share of equity in total capital (autonomy ratio), times; K7 – current liquidity (total coverage), times; K8 – fast liquidity (intermediate coverage), times; K9 – absolute (immediate, instantaneous) liquidity, times; K10 – asset turnover, times.

Table 2

Normalized ratios

K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
0,149	0,475	0,338	0,003	0,183	1,138	0,453	0,427	1,005	0,763

The results of the calculation with ranking descending are given in Table 3.

Table 3

Integral indicator of an situational approach to the procedure for selecting PPP-projects (regional level)

Region of Ukraine (TOP-10 by integral coefficient)	Integral factor (*Mregion)*
Mykolaiv region	3,661
Kyiv region	3,642
Zakarpattia region	3,620
Odesa region	3,603
Poltava region	3,591

The integral coefficient at the regional level reflects the most favorable basic business conditions, including conditions for the implementation of public-private partnership projects. According to the calculations presented in the table, the most favorable from the point of view of the selected indicators at the regional level is the Mykolaiv region with the value of the integral coefficient 3,661.

As a comparison of the obtained result of the calculation of partial integral indicators, it is possible to find its normal value. This value will allow to determine two groups of objects - with the value of the indicator below and above the norm.

To calculate this coefficient, you can use a modified version of the calculation of a simple private integral indicator, described above:

$$M_{cons} = \sum_{j=1}^{n} Mj, \quad (3)$$

where *Mcons* is a consolidated integral indicator for all levels;
Mj level – j-th integral indicator.

As a comparison of the obtained result of the calculation of partial integral indicators, it is possible to find its normal value. This value will allow identify two groups of objects – with the value of the indicator below and above the norm.

To calculate this coefficient, you can use a modified version of the calculation of a simple private integral indicator, described above:

$$M_j^{norm} = \sum_{i=1}^{n} n_i * N_i, \quad (4)$$

where M_j^{norm} is the normal value of the integral index of the *j-th* grade level;
n_i is the normal value of the *i-th* indicator;
N_i is the normalized coefficient of the i-th indictator.

The formula allows not only to group objects, but also serves as the basis for a probabilistic analysis of the dynamics of an integral indicator, as well as an initial basis for calculating a composite integral indicator for all levels of assessment.

An additional parameter for assessing the risks of implementing projects both in a given industry (type of economic activity) and in a certain territory is the level of transaction costs in the value of goods, products (works, services) or depending on the level of transaction costs in revenue (net) from the sale or gross value added of goods (works, services).

For example, one of the variations of the absolute project risk index (in this case, the object of analysis) was calculated on the basis of the transactional approach as a test of an situational approach to the selection of public-private partnership projects. The absolute risk index was calculated by assigning the operating costs of enterprises and organizations to the cost of goods (works, services) according to the following general formula:

$$I(R)_i^- = \frac{CT_i}{V_i}, \quad (5)$$

optimality of *I(R) i* – project → min (commercial goals),
where *I(R)* of the *i* project is the absolute risk index of the project;
Vi – change in output (in cost bridge or in-kind) for the project;
CTi – change transactional project costs.

The criterion for the optimality of this indicator is its striving for minimum values. Since this indicator counts in the range of 0 to 1, then the smallest value will be close to 0. On the basis on Table 4 shows the calculation of the absolute risk index for the regions of Ukraine in order to determine the territory with the most inappropriate business conditions, including the implementation of public-private partnership projects.

Table 4

Transactional approach by regions of Ukraine

Regions of Ukraine	Transaction costs
Donetsk region	0,482
Lugansk region	0,415
Sumy region	0,287
Zaporizhzhya region	0,272
Harkiv region	0,212

The base for calculating the index was the data on the total value cost of goods, products (works, services) and the amount of commercial and administrative expenses of enterprises and organizations for all types of economic activity registered in the country in January – October 2018.

According to the calculations presented in table. 4, the regions of Ukraine with the highest level of transaction costs and, accordingly, with the highest risk of project implementation is Donetsk region – the value of absolute risk index 0,482. High risk index for this region due to the conduct of hostilities, low infrastructure development, the lack of sufficient production facilities and, as a consequence, significant amounts of commercial and administrative costs to conduct current activities.

Conclusions from the conducted research. The implementation of public-private partnership projects from the point of view of the state indicates that the choice of places for the application of projects is based on the opposite principle in comparison with commercial projects. A high absolute risk index determines the territories in which the need to create new infrastructure projects is greatest. The position of the business is diametrically opposite - the choice is based on the lowest absolute risk index.

Evaluation and multi-level analysis based on integral indicators, absolute and relative risk indices are sufficient for a reasonable selection of public-private partnership projects according to the criterion “least project implementation risks – the greatest effects in various areas (social, commercial, budgetary, economic)”, number of PPP projects, having a lot of regional features of implementation and business conditions.

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