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Application of budget allocation models in the management of investment processes in the context of the digital economy development

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Abstract

Within the study, the use of the public-private partnership mechanism in the management of investment processes in the context of digitalization was argued. The methodological basis of the study was a process approach, which allows to study multidirectional investment actions and the interdependent impact of the investment process, which determines the causal links of the development of investment entities at different levels in the collection of resources, in the conditions of the development of the digital economy. Endogenous sources include financial resources of internal and external origin. Exogenous investment resources include financial resources on loan, as well as budgetary allocations. Varieties of budget allocations include government procurement, concession, life cycle contract. Comparativecreativecharacterization of investment resource attraction models was carried out at the expense of budgetary allocations. In conclusion, they highlight the advantages of attracting investment resources at the expense of budgetary allocations, namely the public-private partnership model as a concession. Finally, it carriesout the comparative characteristic

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of the conditions of the implementation of investment projects in various models of attraction of investment resources at the expense of budgetary allocations.

Keywords: budget allocation; state-private partnership; investment processes; investment resources; digital economy.

Aplicación de modelos de asignación presupuestaria en la gestión de procesos de inversión en el contexto del desarrollo de la economía digital

Resumen

Dentro del estudio se argumentó el uso del mecanismo de alianza público-privada en la gestión de los procesos de inversión en el contexto de la digitalización. La base metodológica del estudio fue un enfoque de proceso, que permite estudiar acciones multidireccionales de inversión y el impacto interdependiente del proceso de inversión, que determina los vínculos causales del desarrollo de las entidades de inversión a diferentes niveles en la captación de recursos, en las condiciones del desarrollo de la economía digital. Las fuentes endógenas incluyen recursos financieros de origen interno y externo. Los recursos de inversión exógenos incluyen recursos financieros en préstamo, así como asignaciones presupuestarias. Las variedades de asignaciones presupuestarias incluyen contratación pública, concesión, contrato de ciclo de vida. Se realizó la caracterización creativa comparativa de los modelos de atracción de recursos de inversión a expensas de las asignaciones presupuestarias. Como conclusión se destacan las ventajas de atraer recursos de inversión a expensas de las asignaciones presupuestarias, a saber, el modelo de asociación público-privada como concesión. Por último, se lleva a cabo la característica comparativa de las condiciones de la implementación de proyectos de inversión en varios modelos de atracción de recursos de inversión a expensas de las asignaciones presupuestarias.

Palabras clave: asignación de presupuesto; asociación estatal-privada; procesos de inversión; recursos de inversión; economía digital.

Introduction

Current challenges of increasing threats and risks are relevant to the study of the issues related to the attraction of investment resources in the activities of economic entities at the level of microeconomic systems, areas of activity, regions and the state as a whole. This is due to the limited self-financing of businesses at different levels, global and local threats and risks, the presence of inflation. Changes in the credit and banking, and currency system, fluctuations in energy prices, etc. should be also considered.

Attracting investment resources and the efficiency of their use makes it possible to modernize the production capacity of economic entities of different levels, to increase their profitability, to solve problems of inclusive and sustainable development. The activation of investment processes has a positive effect on economic growth and sustainable development of economic systems at various levels. Attracting investment resources are expressed through the investment of resources to increase the capital of enterprises, areas of activity, regions, state.

The purpose of the study is to justify the use of the mechanism of public-private partnership in the management of investment processes in the context of digitalization.

1. Literature Review

The study of budget allocations in the management of investment processes, public-private partnerships, and their role in regional development in the context of digitalization is devoted to the scientific achievements of domestic and foreign scientists, namely: Abramova (2021); Ahmad and Raza (2020); Albalate, Bel, Geddes. (2020); Armand (2020); Balykina and Zakharov (2015); Belyaev (2020); Cosmulese (2019); Chen (2021); Dergaliuk *et al.* (2021); Dubyna *et al.* (2018); Elwakil and Hegab (2020); Fedyshyn *et al.* (2019); Fleta-Asín and Muñoz (2021); Garafonova *et al.* (2021); Grigoras-Ichim *et al.* (2018); Kadhim *et al.* (2020); Khan *et al.* (2020); Khanin *et al.* (2021); Kholiavko *et al.* (2020, 2021); Kychko *et al.* (2021); Mashnenkov *et al.* (2021); Popelo (2017); Pravkin *et al.* (2020); Prokopenko *et al.* (2018); Qin *et al.* (2021); Raza *et al.* (2021); Samiilenko *et al.* (2021); Samoilovych *et al.* (2021); Shahbaz *et al.* (2020); Shevchuk *et al.* (2021); Shkarlet *et al.* (2019); Sresakoolchai (2020); Tulchynska *et al.* (2021); Vovk *et al.* (2021) and others.

According to the results of the study (Kadhim *et al.* 2020), the authors concluded that there is a need for constant state support, the constant flow of funding and the search for other sources. According to the authors, this will help prolong the implementation of investment projects and increase

annual allocations. The authors of the article (Balykina and Zakharov, 2015) have developed a plan support algorithm that can be used to allocate the budget over a period of time based on key performance indicators that are formed in the context of the budget policy framework. The research results of scientists (Chen, 2021) have shown that public-private partnership has significant and positive economic growth and the consequences of spatial space, which can contribute to regional economic integration, embodying its function of economic stability. It is proved that the economic impact of public-private partnership has significant industrial heterogeneity, energy and water public-private partnership have positive externalities.

The authors of the article (Fleta-Asín and Muñoz, 2021) concluded that the support of multilateral development banks has a positive effect on the participation of private investors in public-private partnerships for renewable energy. The authors argue that government actions that contribute to the institutional financing of third parties, as well as to the improvement of their institutions and the economic environment, contribute to setting priorities through a positive impact on private participation.

The research of the article (Raza *et al.*, 2021) is aimed to focus public-private partnerships on renewable energy where it is more efficient. The results of the authors' research will be useful for politicians in developing countries, which will contribute to the rational and effective solution of urgent environmental problems. The authors (Khan *et al.*, 2020) examine the impact of public-private partnership investments in energy and technological innovation on carbon emissions based on the consumption for China. Based on the research, scientists recommend technological innovations for a cleaner production process and public-private partnership investments in renewable energy sources.

The main idea of the study (Ahmad and Raza, 2020) is to examine the impact of public-private partnership investments in energy, technological innovation, economic growth, exports, and foreign direct investment on CO₂ emissions in Brazil. The results of the analysis and the adoption of scientists contribute to the formation of a new view of politicians on the regulation of public-private partnership investments in the energy sector in order to improve the quality of the environment. The importance of public-private partnerships is explained (Sresakoolchai, 2020) by the fact that many governments around the world have budget constraints and may try to prioritize their budgets for other events in need. The authors argue that the ability of the private sector to participate in investment is an important aspect of saving for the government. The authors proved that public-private partnership has certain advantages and risks, depending on the phase of the project.

The authors of the study (Albalate *et al.*, 2020) argue that the use of public-private partnerships is an important component in providing the

infrastructure. According to researchers, attracting private investment and expanding opportunities contributes to the exemption from property taxes, exemption from current legislation on procurement and protection of confidentiality. Within the research (Pravkin *et al.*, 2020), the use of benefits of public-private partnership is suggested.

The authors emphasize the consideration of regional specifics on the example of the rail freight market as a meso-level institution. Scientists suggest the ways to improve legislation on the development of the freight market based on established guidelines for the development of public-private partnership models in transport projects. The scientists' article (Elwakil and Hegab, 2020) is based on a study of the impact of gross national income and the percentage of the population with access to drinking water on the choice of candidate countries for investing in public-private partnerships in water supply projects. The authors simulated the relationship between gross national income and the percentage of the population with the access to drinking water. To classify countries by investment groups, scientists have developed four models.

2. Materials and Methods

The methodological basis of the study. The use of the mechanism of public-private partnership in the management of investment processes in the context of digitalization is a process approach. This is due to the fact that investments are a process of investing in investment objects, in this process, the transformation of the potential of investment entities into capital is highlighted. The process approach makes it possible to study the multidirectional actions of investing, the interdependent impact of the investment process, which determines causal links of the development of investment entities in terms of attracting investment resources in today's growing threats and risks.

The process approach makes it possible to plan, coordinate, optimize and increase the efficiency of investment processes. It also provides an opportunity to simultaneously investigate the impact of the external environment on investment, namely by the state in the form of regulatory, security and protective influence, macroeconomic factors of the development, market economic laws and more.

As a methodological basis, the process approach provides an opportunity to consider the attraction of investment resources as a logical sequence of interrelated actions over time, which, in turn, leads to changes and turns input resources into the end result, which in turn can become an input resource again.

Also, in the process of studying the use of the mechanism of public-private partnership in the management of investment processes in the context of the digital economy development, general economic and specific methods of scientific knowledge are used.

3. Results

Investments have been and remain an important and relevant process for the economic development of economic entities at various levels, they contribute to the development of productive forces, increase profits, social, environmental and economic effects. The process of the formation of investment resources and their attraction depends on many factors, including the process of capital accumulation and redistribution, political and financial stability, economic policy of the state, globalization challenges of social development and so on.

Today's challenges of social development require more and more investment at different levels of economic systems. For businesses, the sources of investment resources can be endogenous and exogenous, depending on their origin. Endogenous sources include the own financial resources of economic entities. Such sources include:

- financial resources of internal origin (for example, the profit of the business entity, initial contributions of the founders, etc.).
- external origin (for example, payments of insurance companies, sale of part of assets, additional contributions of share or share capital, etc.).

They have many different advantages, but their main drawback is the limited and insufficient for the further development of the economic entity at different levels. And this is the main incentive to attract investment resources from exogenous sources.

If we consider in more detail the investment resources of exogenous approval in relation to the entity, they can also be divided into several components such as (Fig. 1):

firstly, attracted financial resources (for example, from the sale of securities, equity and other contributions of legal entities and individuals, venture capital, factoring operations, sales, etc.);

secondly, borrowed financial resources (for example, types of lending, bond loans, investments of non-bank financial institutions, etc.);

thirdly, budget allocations (the participation of budget funding at the level of state or local budgets using different models of public-private partnership is considered).

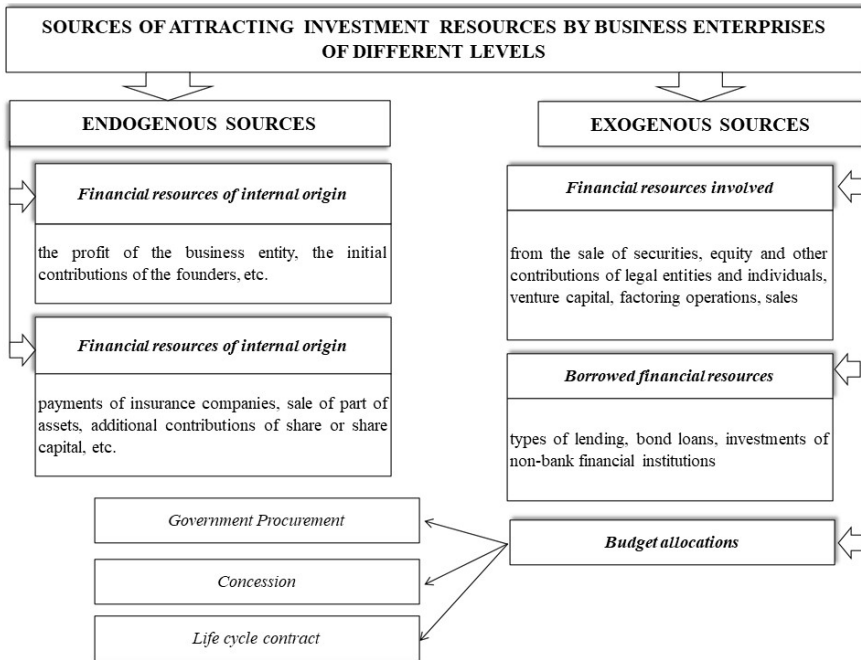


Fig. 1. Varieties of sources of investment resources by economic entities of different levels. Source: suggested by the authors

If we dwell in more detail on budget allocations, the most commonly used models of interaction between private business and public partner are:

- public procurement, including deferred public procurement, in which case financing is provided by the public sector through redistribution of budget funds, debt financing or in the form of soft loans from institutional or commercial banks with the participation of a state guarantee. It should be noted that this model of investment is gradually, as the world experience shows, ceases to be widespread. This is due to the processes of the power decentralization, the reduction of revenues to central budgets and the emergence of more effective models for attracting budget allocations;
- concession, the main essence of this investment model is to transfer the main commercial risks to the concessionaire, namely the risks associated with the level of income from the use of goods and services by the final consumer;

- life cycle contract, in this investment model the risk of demand remains with the public partner, and the private partner implements all stages of the life cycle of the investment project, including the operation and maintenance of the project object;
- combinations of the previous investment models using budget allocations.
- Comparative characteristics of investment models of budget allocations in the context of digitalization are presented in Table 1.

Table 1. Comparative criteria characteristics of models for attracting investment resources through budget allocations in the context of digitalization

Criterion for comparing budget allocation models	Model		
	state purchases	concession	life cycle contract
Terms of the preparation of the investment project (months)	12-24 months when attracting a loan, 3-6 months when deferred payment under a state guarantee	12-36	12-24
Percentage of budget financing of the total cost of the investment project (%)	100	50-80	100 less compensatory business
Percentage of attracted private partner funds from the total cost of the investment project (%)	0	50-20	in the volume of compensatory business
Percentage of state guarantees, from the total cost of the investment project (%)	100	10-20	100 less compensatory business
The core of finding the risks of the investment project	state customer	balance of risks between public and private partner	public partner
Deviation of investment project costs from the planned level in capital expenditures (%)	30-50	3-5	5-10
Deviation of investment project costs from the planned level in operating costs (%)	30-40	Has no data	10-15

Source: suggested by the authors

The presented in Table 1 criterion comparison of models of the attraction of investment resources at the expense of budgetary allocations gives a chance to state that each model has the unconditional advantages and lacks. Thus, according to the model of public procurement, the center of finding the risks of the investment project is the state customer, which reduces the risks of the private partner. Given the application of the life cycle contract model, on the contrary, the main burden of risk falls on the public partner. The public procurement model has a very limited range of involvement in investment processes and very long deadlines for signing agreements and preparing contracts.

But, as already noted, the global trend of attracting investment resources through budget allocations has moved away from the model of public procurement. This is due to the fact that attracting investment resources through such models of public-private partnership as a concession has certain advantages, including:

- a possibility of using the latest innovative technologies owned by the private sector;
- distribution of investment risks in the direction of their transfer to a private partner who has more experience and higher efficiency of such risk management, which, in turn, helps to obtain the effect of value for money in such risk distribution;
- reducing the cost of investment projects through the use of optimal, innovative, creative technologies and motivation of the private partner to reduce investment and the compliance with time periods of its implementation;
- financing of capital investments at the expense of private, not public funds, which reduces the burden on the budgets of different levels;
- maximum reduction of the deviation of investment project costs from the planned level.

Also, the use of the public-private partnership model to attract investment projects has many other advantages over the model of public procurement, which is presented in Table 2.

Table 2: Comparative characteristics of the conditions for the implementation of investment projects for different models of attracting investment resources through budget allocations in the conditions of digitalization

Conditions for financing an investment project	Due to budget financing (public procurement)	Due to the use of public-private partnership (concession)
Technological risk management	A high level of the effective technological risk management is not achieved due to the gap in the competencies of the private sector	High level of the technological risk management because the private partner directly takes care of them at all stages of the investment project
The cost of the investment project	There are no motivating factors to reduce the cost of the investment project, and can be increased in the presence of a corruption component of public administration	Motivates to reduce the cost of the investment project in terms of using the model of attracting investment resources through public-private partnership
Volumes of state funding	The design and construction of the investment project is fully financed by investments from the state (local) budget	Capital expenditures on the investment project are financed by a private partner with partial state financing or state crediting and guaranteeing
Use of innovative technologies	Lack of motivation to use innovative technologies as there is no motivation to reduce the cost of the project and attract the latest technological solutions	Private partner is interested in using innovative technologies to ensure a balance of value and quality of the investment project
Transfer of risks of investment projects	Risk transfer is not used, i.e., the effect of price-quality ratio is not achieved due to risk transfer	With a reasonable distribution of risks on the investment project, the effect of value for money is achieved
Reduction of terms (construction, reconstruction) for the investment project	There is no reduction in the terms of the investment project because there are no motivational mechanisms for this, and often the deadlines are increased due to delays in budget allocations	Motivational factors using public-private partnerships help to reduce the time of implementation of investment projects
Gradual state financing of the investment project	The state financing of the investment project occurs at all its stages from designing to its implementation, financing is carried out for a short period of time.	The state partially finances the creation of an object to attract investment resources, as well as pays service fees for services related to quality infrastructure, distributed over the entire life of the investment project. Deadlines can be reduced by the amount of payment received from end users, when transferring such a function from the state to a private partner

Source: suggested by the authors.

The presented comparative characteristic (Table 2) of attracting investment resources under different models of budget allocations clearly

in the conditions of digitalization demonstrates the greater attractiveness of using the model of public-private partnership compared to public procurement. The mechanism of public-private partnership involvement has strong positive effects for all participants of investment projects both for state (local) authorities and for the private partner, as well as for the final consumer, as it can receive timely and higher quality services and products due to the use of innovative technologies in the investment project.

At the same time, it should be noted that the model of attracting investment resources has negative factors of its implementation that accompany any complex process. Negative factors include a significant political influence and lobbying of the interests of different political elites on the institutional basis and the procedure for regulating the objects of attracting investment resources. This issue is especially acute when the country is experiencing political turmoil, changes in the Government and the Cabinet of Ministers, reforming the political system and economic regulation, legitimate procedures for reviewing and revoking previous decisions to attract investment resources and signing public-private partnership agreements. Also, the facts of bureaucracy and corruption, the shadowing of the economy, can negatively affect the attraction of investment resources and the interaction of public-private partners, lead to an increase in the cost of investment projects.

Conclusion

Thus, the use of such a budget allocation model as a public-private partnership has significant positive effects over other models, such as public procurement. This is due to the fact that public-private partnership makes it possible to reduce the cost of providing services to consumers, develops various creative forms of project financing, establishes closer relationships between the authorities at different levels and private partners and businesses. The mechanism of attracting investment resources using the model of public-private partnership gives other indirect effects in the form of increasing employment, reducing the cost of services, including socially significant, helps to solve environmental problems.

The scientific novelty of this study is that based on the process approach to attracting investment resources and highlighting the criteria characteristics of budget allocation models justify the principles of using the mechanism of public-private partnership in managing investment processes in the context of digital economy development.

Further research requires the activation of power structures at various levels to intensify the attraction of investment resources through the model of public-private partnership.

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