



## Risks in Investment and Construction Design: Domestic and Foreign Experience

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### Abstract:

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The purpose of the article is to review scientific research in the field of risk identification in investment and construction design based on the experience of Russian and foreign scientists. The distinctive methodological features in the designation of the relevance of this process among Russian and foreign scientists are revealed. In the scientific works of foreign researchers, the emphasis is placed on risks that lead to an increase in transaction costs: risks of transaction costs, managerial and organizational risks (contractual risks), information risks, and contractual risks. The methodology of risk research in Russia is aimed largely at classifying risks at the stages of the life cycle of an investment and construction project and on the way to reducing risks. As construction organizations need to adapt to constant changes and alterations in their field, it creates the need to develop existing management approaches based on the principles of economic efficiency. Economic efficiency is closely related to risk management.

### Keywords:

Investment and construction design, research risks, transaction costs

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## Introduction

The purpose of the article is to review the existing theoretical and practical approaches to measuring the risks of organizations of the construction complex both in Russia and abroad, affecting the final results of the organizations' activities and the implementation of investment and construction projects. This purpose involves the analysis of risks in the activities of construction organizations, their classification and methods of risk minimization.

## Theoretical approaches to risk research

The results of the analysis of scientific articles show that a sufficient number of studies have been conducted in the field of risk distribution between construction participants so that certain conclusions can be reached. But the work is still ongoing and most of the research in this area has been carried out by scientists from Russia, China, the USA, and Bulgaria. Below is an analysis of risks in the implementation of investment and construction projects, directions for reducing risks and an analysis of their impact on costs (including transaction costs).

### 1. Risks of increasing transaction costs.

Chinese and American scientists came to the conclusion in their article (Li et al., 2013) that the actual cost of a construction project consists not only of production costs, but also of transaction costs. Transaction costs include the costs of preparing the tender package, evaluating and drafting the contract, administering the contract and eliminating any deviations from the terms of the contract. Transaction costs are an important part of a construction owner's budget. However, understanding transaction costs is difficult due to the inconsistency of the definition of transaction costs in the literature.

### 2. Managerial and organizational (legal) risks.

The authors (Sambasivan et al., 2017) chose the construction industry of Tanzania (TCI) as the object of the study, which ranks fifth among all sectors of the economy, accounting for 8% of GDP and employing 10% of the Tanzanian workforce. The study revealed the following risks and their consequences in the Tanzanian construction industry: design changes, delays in payments to contractors, delays in communication, poor project management, disagreements on the amount of work performed, and the consequences of risks – violation of deadlines, cost overruns, disputes and other negative consequences.

### 3. Risks of increasing transaction costs due to distorted information

Researchers (Guo et al., 2016) made an attempt in the article to find out how uncertainty factors affect transaction costs and determine ways to minimize transaction costs borne by the owner of the construction. They point out that there is no consensus in the scientific literature regarding the standard definition and structure of transaction costs in the construction industry. In this sense, their conclusion coincides with the opinion of Russian scientists. The structural equation model was tested using data collected through a survey conducted among building owners.

The obtained results show that the transaction costs borne by the owner can be minimized by minimizing the uncertainties inherent in the construction project by

ensuring maximum completeness of the engineering design before submitting bids to contractors, harmonious relations between project participants, fair distribution of risks, experience in implementing similar types of projects, and effective methods for selecting contractors.

Velina Yordanova from Bulgaria examines in her article (2023: 107) the issue of the relationship between risk and uncertainty, calling insufficient initial information one of the causes of risk, which leads to uncertainty. The author writes that risks in construction usually lead to two undesirable results: failure to meet deadlines and additional work on the site, which leads to an increase in the cost of construction production. We believe that additional costs due to increased prices and extended deadlines are the sources of transaction costs.

#### 4. Contractual risks.

Scientists from Vilnius Technical University came to the conclusion in the article (Peckiene et al., 2013) that all construction projects have certain risks. The authors conducted a large-scale analysis of the distribution of risks in the implementation of construction projects based on the analysis of 77 articles from the Web of Science database, starting from 1999.

All project participants face risks – owners, contractors, designers, suppliers, etc. However, the more important the role the parties play in the development and successful completion of the project, the greater the risks they have to bear. Such participants in investment and construction projects are the owner and the contractor, who enter into a contract for the performance of construction work. Fair distribution of risks between the parties is very important. Although, on the one hand, the study emphasizes the relevance of fair distribution of risks, on the other hand, the task of proper distribution of risks between the parties rests with only one party, that is, the owner. As a rule, the owner wants to shift more risks to the contractor and take as little risk as possible. In this case, the contractor may increase the bid price for the project based solely on the fact that the responsibility for circumstances that may arise during the implementation of the project lies solely with them. This automatically „programs“ the results of incorrect risk distribution.

### **Research of ICP risks and risk reduction methods in the works of Russian scientists**

The analysis of Russian researchers is no less important and significant than the research of foreign scientists. The authors would like to draw attention to the article by Asaul A.N., Ivanov S.N. (2012), which proposes a structure of transaction costs. The largest share of transaction costs is associated with the search for information (47%), with the planning of interactions between entities (29%), and with the protection of property rights (16%). Scientists believe that transaction costs arise due to the information and communication uncertainty of the activities of participants in the investment, construction and operational processes. The authors of the article conducted a number of studies, the results of which helped to classify transaction costs by stages of the investment and construction cycle (ICC) (see Table 1).

What risks lead to such a share of transaction costs? At the pre-investment stage, the issue of justification and decision-making on the expediency of moving to the investment stage of the ICP is resolved, and a package of documents necessary for pre-project preparation of construction is developed.

**Table 1. Structure of transaction costs of some stages of the ICC**

Stages of the ICC	Transaction costs by group			
	Research and information search	Interaction planning, negotiations	Provision of technological processes	Protection of property rights
Total, %	47	29	8	16
Stage 1. Evaluation and selection of investment intentions	6.2	0.7	8	0
Stage 2. Development of a business plan	35.7	0.5	0	0
Stage 3. Legal registration	0	11.5	0	7.3
Stage 4. Pre-project preparation, design	2.3	6.3	0	0
Stage 5. Construction, reconstruction	1.2	4.9	3.7	0
Stage 6. Project implementation, registration of rights	1.6	5.1	4.3	8.7

*Source: compiled from the source (Asaul & Ivanov, 2008)*

The further fate of the project depends on the completeness and objectivity of the information. As an example, information risks are associated with incomplete and biased information presented in the concept of a construction project: incomplete engineering surveys, incorrectly formulated investment goals, etc. Let's pay attention to a large share of information risk when drawing up a declaration of intent to invest in construction. The book (Mazur & Shapiro, 2009) shows the approximate error of the ICP budget in accordance with the stages of the project. The authors presented these data in Table 2.

**Table 2. An example of estimating project budget errors under risk conditions (fragment)**

Project stage	Type of budget	Budget assignment	Error, %
Project concept, declaration of intent	Budget expectations	Pre-planning and financial needs	25-40

*Source: compiled from the source (Mazur & Shapiro, 2009: 480)*

Table 2 shows that the maximum errors occur at the stage of pre-investment research, which is due to the lack of complete and reliable information about the conditions of project implementation and the level of financing. Project financing risks may arise not only at the project planning stage, but also at the stage of completion of its implementation in the operational phase, as well as at the control and monitoring stage.

Risk factors can be associated with both changes in the external environment (exogenous) and changes in the internal circumstances of the project (endogenous). It is impossible to fully exclude the impact of risks on the implementation of investment and construction projects, however, using risk management methods, it is possible to reduce the impact of risks both on the performance indicators of the project and the implementation of the project as a whole.

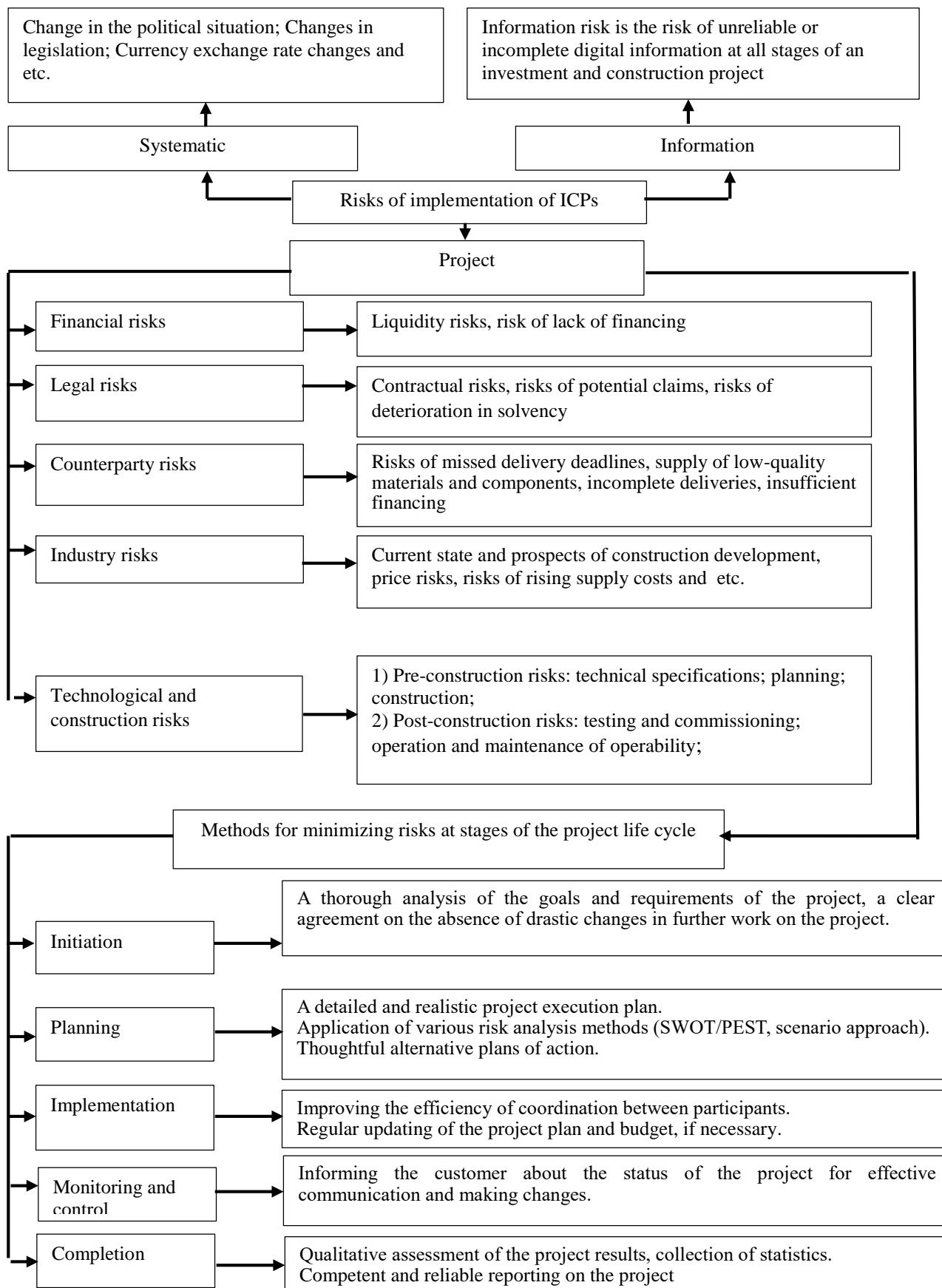
A significant number of works by Russian authors are devoted to risk management and methods of its minimization in investment and construction design.

### **Risk management and risk minimization methods in ICPs**

The first step in identifying risks is the classification of risks in relation to the project (see Fig.1). Most commonly used minimization methods risks in construction are shown below.

Digital and information technologies as a risk reduction mechanism.

Figure 1. Methods for minimizing risks at stages of the project life cycle



Source: Compiled from the source (Zaikovsky & Kornienko, 2024)

The work (Tikhonov & Shalina, 2023) reveals the issues of risk management in ICP. The main stages of risk management are identified: risk identification, qualitative and quantitative risk analysis, risk response planning, risk response implementation and risk monitoring. The situations of the Pandemic - 2020 and Sanctions - 2022 were analyzed for the purpose of comparing these situations and compiling a SWOT analysis of the company's state in conditions of uncertainty with and without the use of digital technologies. A conclusion is drawn about the positive impact of digital and information technologies on the risks generated by the external environment (exogenous), which makes it possible to reduce their impact on the final results of organizations and the implementation of investment and construction projects. The use of BIM technologies as a direction for risk reduction. The work (Shalina & Larionova, 2021) also reveals issues of risk minimization taking into account the use of BIM technologies. An assessment of the probability and average severity of the consequences of risks leading to an increase in the cost of the project was carried out, and the most significant of them were identified: inaccuracies in the design of a construction project and the influence of the human factor when choosing design solutions, which confirms the research of previous authors.

Next, according to the average probability of risks, is the risk of a lack of automated tools for recognizing problems in design documentation. The solution to this problem is considered through the use of BIM technologies. Measures to prevent risks using BIM technologies are disclosed through methods for preventing the occurrence and increase in the cost of ICP. It is noted that BIM technologies, having extensive functionality for reducing ICP risks, lead to a decrease in risk adjustments in the discount rate and, accordingly, increase ICP performance indicators such as net present value, internal rate of return.

As for risk management of an investment and construction project, the content of management includes the following stages:

- initial identification of risks in the form of the maximum possible list - risk checklist;
- expert analysis of the list of risks in order to eliminate insignificant risks (having a small value for the project or low probability). Such analysis can be done using the Pareto chart. There are other ways to identify minor risks, such as constructing a „Probability-Damage Severity“ matrix. Insignificant risks are those that fall into the lower left part of the matrix;
- development of measures to respond to the remaining significant risks in order to minimize them. Figure 1 shows the main areas of risk minimization at the stages of the project life cycle. But the authors pay attention to measures to respond to significant risks: risk elimination by eliminating risk factors; risk transfer to the customer, subcontractors, suppliers; reducing the likelihood of risk and risk retention by allocating funds to cover damage.

Risk management work is organized by the project manager and he is solely responsible for the project risks. If necessary, project participants are involved.

## Conclusion

The analysis of research by Russian scientists devoted to both the risks of implementing investment and construction projects and methods of minimizing them allowed us to come to the following conclusions:

1. When implementing investment and construction projects in Russia and abroad, the magnitude of risks at various stages of the project life cycle are close in values and their maximum value falls on the stage of pre-investment research, which is due to the lack of complete and reliable information about the conditions of project implementation and the level of financing.
2. There is no single approach to the structure of transaction costs and, accordingly, no empirical study of transaction-related issues has ever been conducted in the construction industry due to the lack of a common understanding of transaction costs.
3. Digitalization and information technologies have a positive impact on minimizing the risks generated by the external environment (exogenous), which makes it possible to reduce their impact on the final results of organizations and the implementation of investment and construction projects at all stages of the life cycle.
4. The authors of the article (Yudenko M. & Yudenko E., 2017) came to the conclusion that the increase in transaction costs in construction is due, among other things, to the existence of ineffective institutions regulating the activities of construction participants. It has been revealed that ineffective institutes lead to an increase in transaction costs, create administrative barriers and deregulate business activities of entrepreneurs. It is offered to take a methodological principle of complementarity into account when designing institutes. That will allow us to consider each particular institute as interoperation, interdependence and interconditionality of its components – of formal and informal standards. The results of the research say that transaction costs form considerable part of all expenses of entrepreneurs. The calculations show that an income from transaction costs avoidance may considerably increase effectiveness of building organizations and their economical growth.
5. Reducing the efficiency of organizations in the construction sector and in the industry as a whole will allow switch attention to the necessity of the transaction costs reduction and the need to increase the efficiency of risk management.

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