

Research of influencing factors of general contracting contracts risk contagion in project group

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Abstract: *The contagion of risks in general contracting contracts caused by breach of contract by construction enterprises is an important issue in project group management, and construction enterprises lack attention to the risks in general contracting contracts. The article analyzes the business of general contracting contracts, elaborates on the influencing factors of risks in general contracting contracts, summarizes the infectious subjects, sources, media, pathways, directions, and receptors of risk transmission in project group general contracting contracts, and summarizes the mechanism of risk transmission in project group general contracting contracts. Corresponding measures are provided for construction enterprises to address the causes of risks in general contracting contracts.*

Keywords: *construction enterprises, project group, general contracting contracts risk contagion, risk influencing factors*

1. Introduction

With the advancement of the general contracting model, more and more construction companies are starting to sign general contracting contracts to increase control over the work content of each stage of the project and reduce the risks caused by the shirking of responsibilities among contractors. The development of the construction industry has led to intensified market competition. In order to meet their own development needs, construction companies have begun to undertake multiple projects simultaneously and adopt project group management methods to manage the multiple projects undertaken, in order to obtain benefits that cannot be achieved by a single project. As the number of projects managed by construction enterprises increases, the difficulty of their management also increases, and the probability of their own breach of contract leading to the occurrence of risks in the general contracting contract continues to increase. If the construction enterprise is unable to cope with the impact of the general contracting contract risk, the general contracting contract risk will be transmitted to other participating parties in the project group. At present, there are relatively few papers on the risk contagion of project group general contracting contracts, so construction companies are unable to effectively cope with the risks of general contracting contracts. This article summarizes the relevant theories of risk contagion in project group general contracting contracts, elaborates on the influencing factors of general contracting contract risks, and provides relevant suggestions for construction enterprises to help them better cope with general contracting contract risks.

2. Literature Review

2.1 Project group risks

Domestic scholars have conducted relevant research on project group risks. Xu Dongping et al. studied the logical structure and transmission path of risk contagion in project clusters through complex network theory. Among them, the probability of risk contagion occurring during the demolition phase of old buildings in sub projects is relatively high, and insufficient government support accounts for a high proportion of risk factors. Obtaining relevant government support can help construction enterprises complete the construction of project clusters on time [1]. Li Qian et al. analyzed the contagion mechanism of project group risks using complex systems and proposed a conceptual analysis framework for the dual contagion of physical structure of project components and logical structure of risk factors. The study showed that there are multiple types of risk contagion mechanisms coexisting in project groups [2]. Jiang

Xin et al. used the theory of set pair analysis to construct a risk assessment and prediction model for resource conflicts in engineering project groups. They used the five elements connection number to conduct static risk assessment of resource conflicts in project groups, and verified the feasibility of the model with specific examples of hydropower stations [3]. Shi Bijuan et al. proposed a research paradigm diagram for the risk of project group construction based on the different growth stages of large construction enterprises. They summarized the influencing factors of project group construction risk through literature analysis and proposed a conceptual diagram of the role of risk influencing factors in the enterprise growth system. The universality of the paradigm diagram was verified through simulation [4].

2.2 General contracting contract risks

Chen Qiaoling studied the influencing factors of risks in general contracting contracts from four aspects: subcontracting, construction period, cost, and the construction enterprise's own construction capacity. The results showed that the signing of subcontracting contracts, prediction of construction period, establishment of communication mechanisms, and cost management would affect the risks in general contracting contracts. Corresponding prevention plans were proposed for these four aspects [5]. Ma Yanfeng et al. introduced the background, mode, and management principles of general contracting contract financing, analyzed the main risk points of the general contracting contract financing mode, and proposed corresponding preventive measures to construction enterprises for the main risk points [6]. Du Yu et al. identified and classified the risks of general contracting contracts based on the "Construction Project Engineering General Contracting Contract", obtained a list of general contracting contract risks, and compared it with international FIDIC contract risks. They found that the silver book has the characteristic of being "pro owner" and will bring more risks to general contractors. They further analyzed the possibility of "going global" in the "Construction Project Engineering General Contracting Contract" [7]. Sun Yu conducted a study on the change management of EPC general contracting contracts for LNG receiving station projects, proposed the establishment of a contract change management organizational structure to unify the management of contract changes for LNG receiving station projects, identified contract change risks, and proposed risk prevention measures before, during, and after the change risks to construction enterprises [8]. Yan Ling et al. studied the risks of general contracting contracts caused by changes in the owner's own requirements and the owner's response to changes in construction plans, and discussed the basis for the responsibility of general contracting contract risks caused by these two methods, providing a basis for construction enterprises to respond to changes in general contracting contract risks [9]. Choi et al. (2022) applied natural language and machine learning techniques to analyze the risks during the bidding stage of general contracting contracts, making breakthroughs in the development of general contracting contract dictionaries, reducing the workload and time of general contracting contract management personnel for construction enterprises, and providing support for reducing general contracting contract risks [10].

3. Theoretical Analysis

3.1 General contracting contract business process

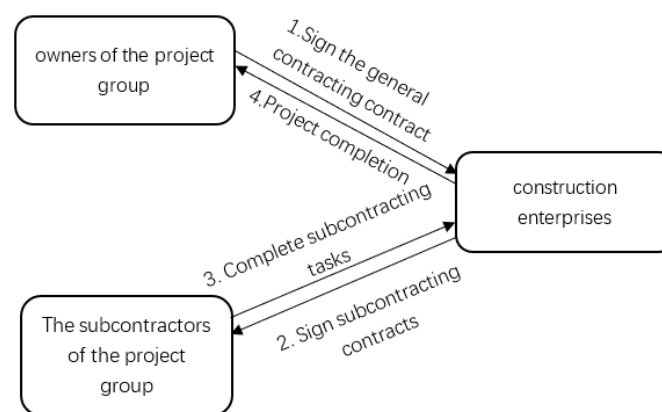


Figure 1: General contracting contract business process

The main participants in the general contracting contract business process include construction enterprises, as well as owners and subcontractors of various projects in the project group. The owners of each project in the project group sign a general contracting contract with the construction enterprise to determine the content and requirements of the work; Construction companies establish project departments for each project based on the general contracting contract, and subcontract appropriate work content to subcontractors to ensure that each project in the project group is completed smoothly according to the requirements specified in the general contracting contract. The business process of the general contracting contract is shown in Figures 1.

The explanation of each link in the business process is as follows:

(1) The construction enterprise signs general contracting contracts with the owners of each project in the project group to determine the work content and acceptance standards of each project.

(2) Construction companies establish project departments for each project based on the general contracting contract, and the project departments are responsible for the preparation work of each project. Part of the work of each project is handed over to subcontractors through the signing of subcontracting contracts.

(3) The subcontractors of each project in the project group shall complete the agreed work content in accordance with the requirements of the subcontracting contract, and pass the acceptance inspection. The construction enterprise shall pay the corresponding engineering fees.

(4) The construction enterprise shall complete the work content of the general contracting contract for each project in the project group, deliver the project to the owners of each project in the project group, and pass the acceptance inspection. The owners shall pay the engineering fee to the construction enterprise.

The subcontracting contracts signed between the construction enterprise and the subcontractors of each project in the project group are prepared based on the general contracting contract, and the prerequisite for completing the project according to the requirements of the general contracting contract is that the subcontracting tasks of each project are completed according to the subcontracting contract. Therefore, although the construction enterprise and the subcontractors of each project in the project group have a subcontracting relationship, the risks of the general contracting contract can still be transmitted to the subcontractors.

3.2 Factors influencing the risks of general contracting contracts

3.2.1 Internal causes of risks in general contracting contracts

(1) Project management capability

The project management ability of construction enterprises mainly depends on the work ability and relevant work experience of project management personnel. The control of project management personnel over project progress, personnel arrangement, resource utilization, and fund operation determines whether the project can be successfully completed in accordance with the requirements of the general contract. Rich work experience and good work arrangements can avoid resource and process conflicts, better grasp the progress and quality of project work, reduce the probability of self breach, and help to achieve the requirements of the general contracting contract smoothly. Construction enterprises should choose suitable project management personnel based on the scale of the project and the specific requirements of the general contracting contract, to ensure that the project management ability of the management personnel meets the standards and better cope with various problems.

(2) Project funding ratio

The proportion of advance funds for a project is influenced by the project scale and the owner's cash flow situation. In the early stage of the project, construction companies will pay a portion of the project funds in advance to ensure the smooth progress of the project. After completing a certain work progress or project completion, the owner will make the payment. As the proportion of advance funds increases, the risks that construction companies need to bear also continue to increase. Once the owner is unable to pay the project funds on time due to cash flow problems. It will have an impact on the financial operation of the construction enterprise itself. If the reserve funds of the project are not enough to help the construction enterprise support the owner to solve the capital turnover problem, it will inevitably cause risks in the general contracting contract, affect the project schedule, and even cause shutdown, losing the interests of all project participants. In order to better cope with the risks of general contracting contracts,

construction companies should control the proportion of advance funds and reserve sufficient financial reserves. After the completion and acceptance of tasks in each stage of the project, they should communicate with the owner in a timely manner to ensure timely payment of project funds and protect their legitimate rights and interests.

(3) Project risk tolerance

The project risk tolerance of construction enterprises determines the project's ability to resist various risks, including general contracting contract risks, and has a significant impact on the attitude of project managers towards risks and the measures they take. The project risk tolerance depends on the construction enterprise's financial support for the project, the relevant work experience of project management personnel, and the cooperation with the project owner and subcontractors. The stronger the project risk tolerance, the easier it is to withstand the impact of risks. More financial support, richer management experience, and good cooperation are more conducive to improving the project risk tolerance, even if risks occur in the general contracting contract, As long as corresponding remedial measures are taken and effective communication is carried out with the project owners and subcontractors, the corresponding losses can be minimized as much as possible, and the risks of the general contracting contract can be contained in this project, avoiding the transmission of the risks of the general contracting contract to the owners and subcontractors of related projects, causing more losses.

(4) The degree of correlation between projects

The built project group of construction enterprises is composed of a group of interrelated projects with resource, benefit, technology and other related relationships. These related relationships are very important for the project to be completed according to the requirements of the general contracting contract, which also makes it difficult for the projects in the project group to be independent. Once a project in the project group incurs a general contracting contract risk. It is possible to transmit the risks of the general contracting contract to related projects along the correlation between projects, so the degree of correlation between projects has a significant impact on the contagion of risks in the general contracting contract of the project group. The greater the degree of correlation between projects in construction enterprises, the more susceptible the project is to the impact of related projects. Adjusting the degree of correlation between projects is crucial for project management personnel. It is necessary to reduce the degree of influence of related projects on the project and ensure that the project is completed in accordance with the requirements of the general contracting contract, ensuring the profitability of the entire project group.

(5) The degree of information sharing between projects

There are differences in the level of information mastery and utilization among project managers in the project group, resulting in different information possessed by each project. In order to ensure that the project is completed according to the general contracting contract and better achieve the goals of the project group, it is necessary to share information among the various projects in the construction enterprise project group to avoid making wrong decisions due to insufficient information. The higher the degree of information sharing between projects, the more conducive it is for project management personnel to understand the actual situation of the project itself and the related projects of the project group. Even if a certain project in the project group has a general contracting contract risk, as long as the information sharing is timely and accurate, emergency adjustments can be made to alleviate the pressure of general contracting contract risk transmission. Improving the degree of information sharing between projects is also beneficial for owners and subcontractors of various projects in the project group to timely obtain corresponding information from construction enterprises, enhance mutual trust, and avoid the non-circulation of information leading to delayed project progress and the occurrence of risks in general contracting contracts.

3.2.2 External factors of risks in general contracting contracts

(1) Natural environment

The impact of natural environmental changes on project construction is immeasurable, and construction companies cannot predict and take preventive measures in advance. For example, typhoon, rainstorm, earthquake, fire and other natural disasters will cause irreversible losses to the project. In addition to actual losses to the construction enterprise, they will even affect the normal operation of the project, affect the project duration, and cause the project to be unable to complete in accordance with the requirements of the general contract. The occurrence of natural environmental risks increases the possibility of breach of contract by construction companies. When undertaking projects, construction

companies should consider the possible impact of the climate conditions in the project location on the project, and prepare corresponding contingency plans. Once a natural disaster occurs, emergency contingency plans should be taken immediately to quickly respond to the impact of natural disasters and minimize the losses caused by natural disasters.

(2) Policy environment

The country or relevant government departments will adjust relevant policies according to development needs, such as restricting the types and quantities of government investment projects in certain regions during certain time periods. This will inevitably lead to competition among construction companies in the region for projects, and even target projects in other regions, increasing the difficulty of winning bids and even expanding the scope of influence. Relatively weak construction companies often blindly bid to increase the probability of winning the bid, without considering their actual situation, greatly increasing the probability of occurrence of risks in general contracting contracts. The adjustment of relevant policies may also conflict with the general contracting contract. If there is no agreement on how to handle similar changes in the general contracting contract, it will increase the difficulty of construction enterprises. Construction enterprises should quickly eliminate the impact of policy adjustments on the normal operation of the project, predict the direction of future policies, take preventive measures in advance, and reduce the probability of the occurrence of risks in the general contracting contract.

3.3 Risk contagion factors in project group general contracting contracts

3.3.1 Risk contagion sources of project group general contracting contracts

The source of risk contagion in the general contracting contract is the enterprise in the project group that breaches the contract due to various reasons, resulting in the outbreak of general contracting contract risk. It is the foundation of risk contagion in the general contracting contract. Due to the research on the risk contagion of project group general contracting contracts caused by breach of contract by construction enterprises, the source of risk contagion of general contracting contracts is construction enterprises. In the operation process of project clusters, construction enterprises play a crucial role in connecting the past and the future. In addition to liaising with the owners of each project, they also need to liaise with the subcontractors of each project, greatly increasing the difficulty of project management for construction enterprises. This makes construction enterprises more susceptible to internal and external factors such as information asymmetry, difficulties in fund circulation, adjustments to relevant policies, and changes in the natural environment, resulting in risks in general contracting contracts, becoming a source of risk contagion for general contracting contracts.

3.3.2 Risk contagion carriers for project group general contracting contracts

(1) Materials

The normal operation of a project group cannot be separated from the reasonable allocation of various materials. Construction companies should ensure that each project in the project group receives corresponding materials that meet quality requirements before the start of the process. This is a prerequisite to ensure that the project is completed in accordance with the requirements of the general contracting contract. The selection of suppliers is very important. Once there are transportation or quality issues with materials, it can lead to conflicts in the flow of materials between various projects in the project group, causing unnecessary conflicts among projects in order to compete for materials. This may cause a general contracting contract risk for a certain project in the project group and infect projects with insufficient material preparation.

(2) Funding

The operation of funds is the key to the smooth completion of each project in the project group. Construction companies usually need to prepay a sum of engineering funds in the early stage of the project to purchase the corresponding resources required by the project and pay the engineering fees required by subcontractors, to ensure the normal progress of the project process, and to ensure that the owner pays the engineering fees in a timely manner, so that funds can flow reasonably among the various projects in the project group. Once the owner of a certain project is unable to receive payment due to their own problems, it will inevitably affect the normal operation of the subsequent processes of the project, leading to risks in the general contracting contract.

(3) Information

The acquisition and transportation of materials, the operation of funds, the reporting of work progress by various projects in the project group, and mutual communication all rely on the transmission of information. The information asymmetry between projects in the project group is also an important factor in the risk of general contracting contracts. Information is often a difficult element for construction enterprises to control. The top-down information transmission of project groups, the different channels through which project managers obtain information, and the inability to fully share information between projects can all lead to the inability of project managers, owners, and subcontractors to obtain sufficient information, making incorrect judgments and increasing the probability of general contracting contract risks.

3.3.3 Risk contagion pathways of project group general contracting contracts

(1) Contractual relationship

The participants of each project in the project group determine their respective work content and rights and obligations by signing contracts. The owners of each project in the project group and the construction enterprises sign a general contracting contract, which has a general contracting relationship with each other. The construction enterprises will also subcontract some of the work of the project to subcontractors according to the requirements of the general contracting contract, forming a subcontracting contract relationship with the subcontractors of each project in the project group. When a construction enterprise breaches the general contracting contract, the risk of the general contracting contract can be transmitted to the participating parties of the project group along the contract relationship, and even affect its normal operation.

(2) The correlation between projects

The various projects in the project group have resource, benefit, technology and other related relationships, which is also the reason why the risk of the general contracting contract can be transmitted from the project with the outbreak risk to the owners and subcontractors of related projects. Each project in the project group has one or more related relationships with other projects to a greater or lesser extent. The more related projects there are, the greater the degree of association, and the more susceptible they are to the risks of the general contracting contract. Construction enterprises should reasonably consider the degree of correlation between projects when forming project groups, avoid excessive correlation between projects and other projects in the project group, and reduce the probability of contagion of general contracting contract risks between projects.

3.3.4 Risk contagion receptors in project group general contracting contracts

The risk contagion receptors of the general contracting contract mainly include the participants of each project in the project group, including the owners and subcontractors of each project in the project group. When a construction enterprise is unable to complete a project according to the requirements of the general contracting contract due to various factors, it will lead to the outbreak of general contracting contract risk in the project, and the general contracting contract risk will be transmitted to the owner and subcontractor of the project along the contract relationship of the construction enterprise. At this time, the owner and subcontractor of the project with general contracting contract risk are the risk transmission receptors. If the owners and subcontractors of the project with an outbreak of risk can help the construction enterprise solve the risks of the general contracting contract, the risk contagion process of the general contracting contract ends. Otherwise, the risks of the general contracting contract will be transmitted to the owners and subcontractors of the related project along the inter project relationship. At this time, the owners and subcontractors of the related project are risk contagion receptors.

3.4 Risk contagion mechanism of project group general contracting contracts

According to the previous research, when a construction enterprise breaches the general contracting contract risk for a certain project due to various reasons, the risk will be transmitted to the owner and subcontractor of the project based on the contractual relationship of the construction enterprise. If the owner and subcontractor of the project have the ability and willingness to help the construction enterprise eliminate the impact of the general contracting contract risk, the risk transmission process of the general contracting contract will end. This process is called the contagion chain of general contracting contract risks. If the owner and subcontractor of the project are unable or unwilling to help the construction enterprise, the risks of the general contracting contract will continue to be transmitted to the owners and subcontractors of the project group and its associated projects. If the owners and subcontractors of the associated projects are also unable to help the construction enterprise solve the risks of the general

contracting contract, the risks of the general contracting contract will continue to be transmitted to the owners and subcontractors of the projects associated with the associated projects, forming a network of contagion risks in general contracting contracts.

Based on the above analysis, the risk contagion mechanism of the project group general contracting contract can be obtained, as shown in Figure 2.

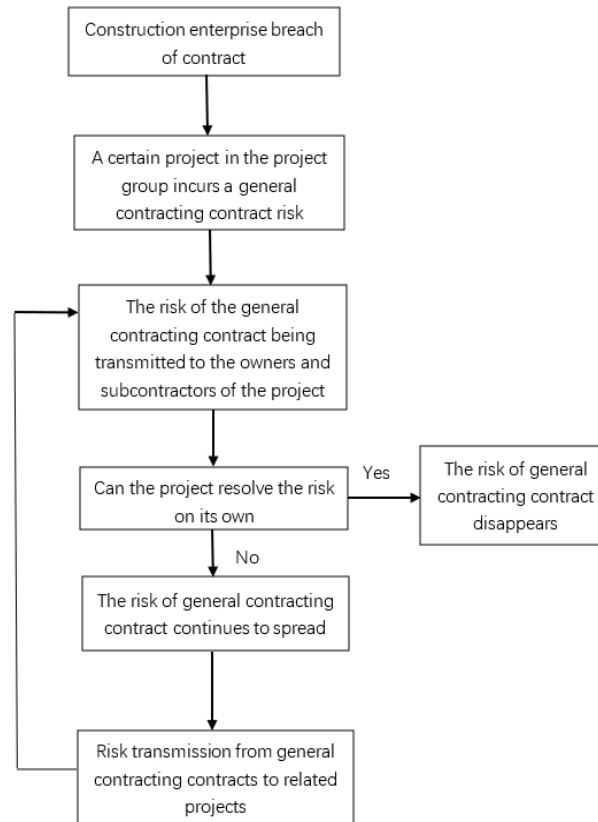


Figure 2: Risk contagion mechanism of project group general contracting contracts

4. Research conclusions and suggestions

This article systematically analyzes the business process of general contracting contracts by reviewing relevant literature on project group risks and general contracting contract risks, and elaborates on the influencing factors of general contracting contract risks from both internal and external perspectives. Among them, the degree of information sharing between projects, the degree of correlation between projects, and the project risk tolerance have a high frequency of occurrence. It also discusses the sources of contagion of general contracting contract risks in project groups analyze the transmission medium, transmission path, and transmission receptor, and summarize the risk transmission mechanism of the project group general contracting contract. Next, some relevant suggestions will be given to construction companies regarding the three high-risk factors that frequently occur in general contracting contracts:

Firstly, enhance resource coordination capabilities. By collecting various technical talents required for each stage of the project, establishing a talent reserve pool for the project group, recruiting relevant technical talents that are greater than the actual needs of the project, ensuring that when there are problems with the technical talents of a certain project, they can be allocated in a timely manner, reducing losses, and avoiding the impact of a shortage of technical talents on related projects, which may lead to the occurrence of risks in the general contracting contract; Before construction, count the types and quantities of various materials required for each project at each stage, contact suppliers in advance to solve transportation problems, reduce cost and time consumption, and take backup measures. If a project has quality or transportation problems with goods, it is necessary to contact backup suppliers or coordinate relevant resources with the material management center of the project group to avoid project delays and substandard quality; Prepare adequate financial reserves in advance to prevent the owner of a

project from being unable to turn over funds and settle on time, resulting in project delays and affecting the overall profitability of the project group.

Secondly, enhance the level of information sharing. Construction enterprises should establish information liaison departments in each project, regularly summarize relevant materials and various information of each project, assist project management personnel in coordinating with owners and subcontractors, and do a good job in organizing and reporting information; Establish an information management center for the project group, responsible for organizing relevant materials for each project and ensuring information transmission. Hold regular meetings to discuss various issues that arise during the construction phase of each project and discuss solutions; Select a suitable network platform based on the actual situation of the project group, strengthen the training of relevant knowledge and skills for information liaison personnel, enhance their proficiency in network platforms, and improve the efficiency of information transmission and sharing.

Thirdly, establish a risk prevention mechanism for general contracting contracts. Construction enterprises should continuously improve their management systems, establish project group management departments, and unify the management of each project; Regularly carry out inspections on various projects, especially in areas prone to problems, to reduce the probability of risks occurring in general contracting contracts from the source; Take emergency measures to identify the source of risks in the general contracting contract and activate emergency plans as soon as possible, in order to prevent the risk of the general contracting contract from spreading to other projects.

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