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RISK MANAGEMENT AND RESPONSE MEASURES FOR BIDDING AND TENDERING IN CONSTRUCTION PROJECTS

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ABSTRACT

Bidding is a necessary procedure for the implementation of construction projects, but also an important link in the preliminary stage of construction projects, it is not only the core procedure to control the schedule, quality and cost, but also a necessary means for the procedural management of construction projects. Therefore, this paper analyses the risk of bidding for construction projects through the Gantt chart method, bidding method, and puts forward the corresponding risk management measures, the first part of the potential risk of bidding analysis, the second part of the risk management in the project bidding through the three parts of the business, internal, and supervision of risk management research, and the third part of the risk management of the measures to cope with the risk management, I hope that this paper's research can give the help related to construction project bidding.

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Introduction.

Bidding work is an important link in the construction project, risk management of bidding work can be in the quality, cost, duration and other aspects of the impact, risk management of bidding for construction projects to help prevent the risk of construction projects exist in the construction project, its quality, cost, duration and other aspects of the impact to ultimately achieve to improve economic and social benefits, enhance the competitiveness of construction engineering enterprises, and improve the market economic system. Improvement of economic and social benefits, competitiveness of construction engineering enterprises, and sound market economic system. At the same time, project bidding management is also a prerequisite to ensure the smooth progress of construction projects, improve economic and social benefits, and enhance the competitiveness of construction enterprises.

Bidding risk management is an important part of bidding management, through the project bidding work on the project cost, schedule development and project quality standards, the project to play a guiding, regulating and restraining role. Cui Fengli believes that under the role of risk

management, the economic losses in the project operation plan can be reduced, and the cost minimisation and benefit maximisation of construction projects can be gradually achieved [1]. Liu Li believes that if the bidding work in a construction project is not implemented in all aspects, it will maximally limit the construction progress in the later stages of the project, and in serious cases, it will also lead to the suspension of work [2]. Therefore, risk management of bidding for construction projects and the preparation of countermeasures to the risks of construction projects is an indispensable part of construction projects. This paper starts from the potential risk analysis of bidding and tendering, and analyses the potential risks of bidding, bidding, bid opening, bid evaluation, bid award, contract performance and other aspects. Risk management in engineering bidding is divided into business management, internal management and supervision and management to analyse and give suggestions for countermeasures.

1. Potential risk analysis of tendering.

1.1 Functional theory of the concept of bidding and tendering.

Fu Yu believes that bidding is a market transaction to promote open market transactions for the procurement of goods and engineering contracting, is a product of the development of the market economy, but also to promote open, fair and just competition in the market economy, a reasonable allocation of the rights, obligations and responsibilities of the bidding parties to the management system [3]. Usually open tendering and invitational tendering two procurement methods, both play a role in the selection of suppliers and contractors business co-operation. However, the two procurement methods have different selection methods and procedures, as shown in Table 1:

Type of action / Bidding method	Mode	Type of project	Effect
Public tender	The purchaser publishes a notice of solicitation to invite all qualified suppliers and contractors to participate voluntarily in the bidding.	Large、Important、High-value	Ensuring transparency, fairness and competition
Invite bids	The procuring entity invites tenders from selected suppliers and contractors on the basis of specific requirements.	Small、Specific、Specialized	Targeted selection based on needs and realities

Table 1. Role of types of solicitation methods.

For both open and invited tendering, detailed solicitation documents such as procurement requirements, technical specifications, bidding requirements, method of quotation, criteria for evaluating bids, etc., are required. The suppliers or contractors prepare the bidding documents according to the bidding documents and submit them to the purchaser before the deadline. The purchaser then evaluates the bidding documents according to the requirements of the bidding documents and finally selects the suitable supplier or contractor for cooperation. The two methods of public tendering and inviting tenders greatly enhance the transparency of construction projects, which in turn achieves the purpose of reducing project costs and improving project efficiency.

Tendering methods are categorized into three types: open tendering, invited tendering and negotiated tendering. It is the unilateral behavior of selecting the trading object from the bidders by inviting many bidders to participate in the bidding. Through the market competition behavior of construction projects, it improves the construction efficiency, reduces the project cost, enhances the transparency of construction projects under the premise of guaranteeing the quality of the project, and then realizes the quality pairing of price and construction. Bidding has the characteristics of risk,

policy, technology, continuity and dynamics, in which the risk of bidding has a direct impact on the project. The common risks of bidding procedures for engineering projects are shown in Table 2:

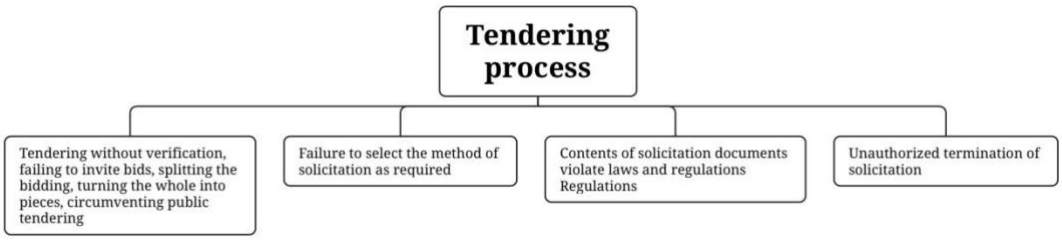


Table 2. Bidding process risks.

1.2 Bidding risk analysis.

Bidding that is, the bidder is invited by the bidder, in accordance with the requirements and conditions of the bidding, in the specified time to tender to submit a bid for the winning behavior. Wang Ruinian believes that bidding, if affected by market turbulence, economic policy adjustment, management concept adjustment, etc., will lead to the damage of the comprehensive benefit of the construction project, but also will make the quality of the construction project and the quality of the pre-estimated difference [4]. This shows that risk management of the bidding company is a scientific guarantee to ensure the smooth progress of the bidding stage of the project. The more common risks in the bidding process are shown in Table 3:

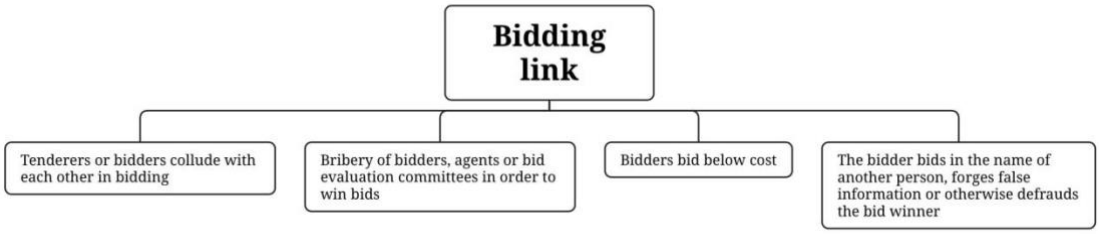


Table 3. Risks in the bidding process.

1.3 Bid opening, bid evaluation, and bid winning risk analysis.

The bid opening, bid evaluation and bid winning links of engineering projects are key stages in the bidding process, and there are also certain risks. The risks involved in bid opening, bid evaluation, and bid winning are as shown in Table 4:

Bid opening、Bid evaluation、Bid winning risks			
	Bid opening risk	Bid evaluation risk	Risk of winning the bid
Risk one	Improper preparation of tender documents	Technical review standards are unfair	The winning bid price was underestimated
Risk two	Inconsistent interpretation of technical specifications	Information disclosure is not transparent	Problems with ability to enforce contract
Risk three	Bid security issue	Bidding process violations	Owner change request

Table 4. Bid opening, bid evaluation, bid winning risks and their countermeasures.

In the bidding process, there are potential risks in the bid opening, bid evaluation and bid winning links. Risks of major deviations and minor deviations caused by incorrect operations by staff are prone to occur. Risks of major deviations include defects in the bid guarantee, omission of the signature or official seal of the authorized representative in the bid document, significant differences from the requirements of technical standards or specifications, extension of the bid completion deadline, inspection standards that do not meet the requirements of the bidding documents, etc. Minor deviations include omissions of individual information and data in files, missing parts of files, etc.

The bid evaluation committee is prone to unfair bid evaluation behaviors such as corruption and bribery, coercion of bid evaluation, subjective bid evaluation, biased bidding, and ignoring objective factors, or improper competitive behaviors in which internal bidding staff leak quotation information of other bidding companies in exchange for benefits, which makes the bid evaluation committee prone to unfair bidding behaviors. The fairness and impartiality of the bid opening is affected. During the bidding process of the project, the bid evaluation committee missed the bidding documents of a qualified company, resulting in significant deviations in the company's bid quotation, which in turn affected the final bid evaluation results. During the bid evaluation process of a project, members of the bid evaluation committee were bribed by the bidder, causing them to favor the bidder during the bid evaluation process and win the bid, which affected the fairness and impartiality of the bid opening. During the bidding process, corporate dishonesty such as false quotations and delayed delivery are prone to occur, and the winning company's capital chain is broken due to financial problems and cannot complete the project as required by the contract. Or, due to financial problems in a project, the capital chain breaks halfway through the project and the work is stopped due to the inability to pay for raw materials and workers, resulting in an extension of the construction period and huge economic losses.

1.4 Signing and performance risk analysis.

Teng Rongqian believes that from the perspective of the macro environment, since the business behavior of the construction market has the characteristics of futures trading, that is, the contract is signed first and production is organized later, the construction company must complete various contract indicators such as construction period, quality, safety, cost, etc., and there are many problems during the performance of the contract. Unforeseen risks. Especially for comprehensive large-scale projects with large specifications, tight construction deadlines, high quality standards, special structures, different shapes, and other special needs, there are often greater risk factors for unsatisfactory project performance capabilities [5]. The performance of a construction project is the fulfillment of the agreement. Both parties to the contract exercise their rights and obligations and perform the performance according to the contract. Contract signing and contract performance risk management have direct or indirect impacts on construction schedule, cost, job employment, subcontracting, project planning, technical support, etc. This shows that it is indispensable to conduct risk analysis on the signing and performance of contracts in the bidding process. Common engineering project contract signing and contract performance procedure risks are as shown in Table 5:

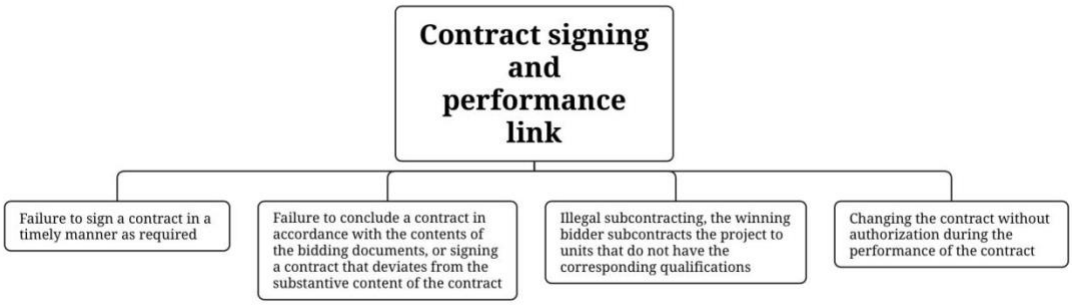


Table 5. Risks in signing and performance of contracts.

2. Analysis of risk management countermeasures in project bidding and bidding.

The goal of project bidding risk management is to identify, evaluate and control potential risks related to bidding and develop corresponding response strategies. Yin Xueqin proposed that in order to better control the risks associated with bidding work in construction projects, bidders must fully consider their own actual needs and characteristics when formulating relevant evaluation standards and selecting evaluation methods [6]. Therefore, we can formulate response strategies for risks involving technology, law, finance, market, etc. by formulating a bidding risk list. Use probabilities and engineering impacts to conduct qualitative and quantitative assessments of potential risks in bidding. Risk matrices, risk indexes and other means can also be used to rank project bidding risks, and manage project risks according to priority. Conduct a detailed technical evaluation of the bidding company during project bidding, and analyze the feasibility of the bidder's construction technology and the company's dependency relationships. And set up backup technologies and suppliers to reduce project risks.

Bidding risk management is an important part of ensuring the fairness, transparency and effectiveness of the bidding process. Through effective risk management, the adverse impact of potential risks on engineering projects can be minimized and the smooth cooperation between purchasers and suppliers/contractors can be ensured. The specific process of bidding risk management is shown in Table 6:

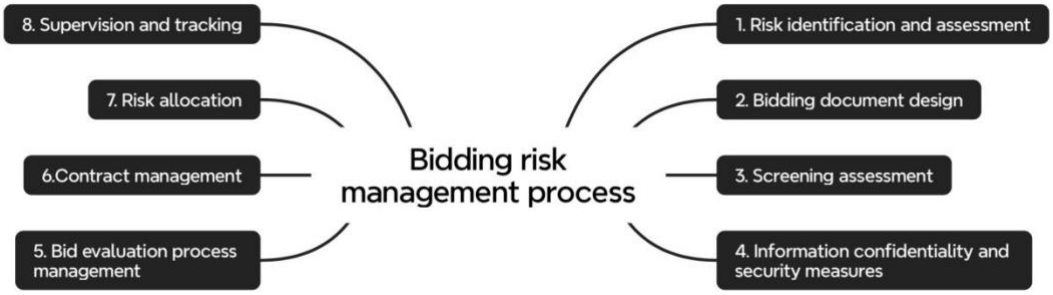


Table 6. Bidding risk management process.

2.1 Business management.

Business management can be divided into procurement department management and business engineering department management. Taking the lead in daily compliance management of the business during project bidding will help improve business management systems and processes. For the entire system, Chinese professor Xie Yun first clarified the management organizations at all levels, defined different roles, granted corresponding authority, and clarified the relationship between each level and role [7]. It also conducts compliance risk identification and hidden danger investigation, issues compliance warnings, and organizes compliance reviews to promptly report risk matters to the leading compliance management department and properly respond to compliance risk events. Carry out work such as confirmation of bidding work and compliance investigation of bidding companies. Investigate and manage irregularities in project bidding and bidding business and make timely rectifications.

Therefore, in project bidding risk management, business management can carry out project management through the following steps: first conduct a comprehensive review of bidding documents, identify potential bidding risks and problems, evaluate the matching degree of project bidding, and formulate specific bidding strategies. Then formulate and optimize the bidding technical plan: according to the project needs and the requirements of the bidding documents, formulate and adjust the construction technical plan, and continuously improve and optimize it to meet the requirements of the bidding project. Finally, we conduct business management on bidding quotations, bid quotations, construction costs, market conditions, bidding competitiveness, etc., thereby controlling risks and ensuring the economic benefits of bidding.

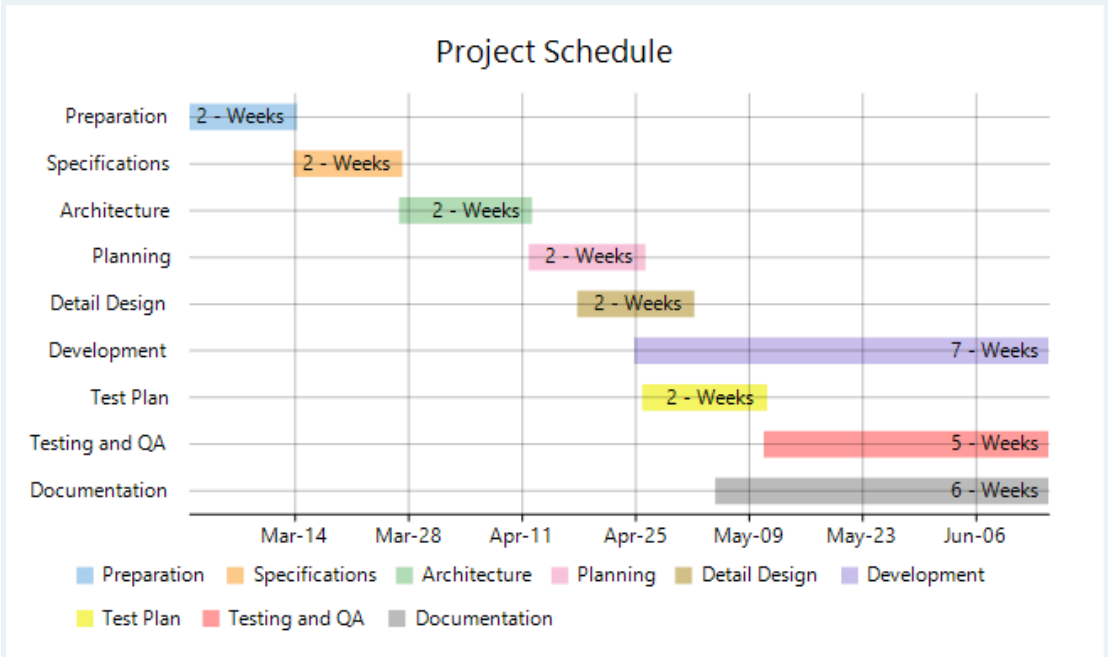
2.2 Analysis of countermeasures for internal management.

The analysis of countermeasures for internal management of construction project bidding can be divided into internal risk management, internal internal control management and internal compliance management. Through the intervention and guidance of procurement risk work, we can review the main internal risk matters of project bidding, such as reviewing suspicious supplier qualifications, supervise the development of procurement risk management during the process, and evaluate the effectiveness of procurement risk management afterwards, etc., to ultimately ensure the bidding work went smoothly.

Therefore, in project bidding risk management, internal management can carry out project management through the following steps: First, organize and coordinate personnel from various bidding departments, coordinate various bidding work, and ensure the efficient operation of the bidding process. The second step is to collect relevant information in a timely manner and share it internally to ensure comprehensive information understanding and communication, and to improve the accuracy and time efficiency of decision-making. The third step is to effectively manage and control the bidding projects to ensure that relevant work is completed on time and with quality, and to reduce project risks.

2.3 Use the Gantt chart method to formulate a reasonable supervision and management system.

Developing a reasonable project supervision and management system through the Gantt chart method can help to more intuitively reflect the time relationship, prerequisite relationship, and subordinate relationship between the project and supervision, and ultimately more intuitively reflect the bidding progress and view the project supervision process. Improve and reduce project risks, improve project efficiency, and effectively improve benefits.



Supervision and management play a decisive role in project bidding risk management. Supervision and management can be divided into company audit, disciplinary inspection and supervision departments. By supervising the authenticity and compliance of the procurement business, we can identify problems and risks in procurement and supervise and modify them. In project bidding risk management, the main responsibilities of supervision and management are as follows: Table 7:

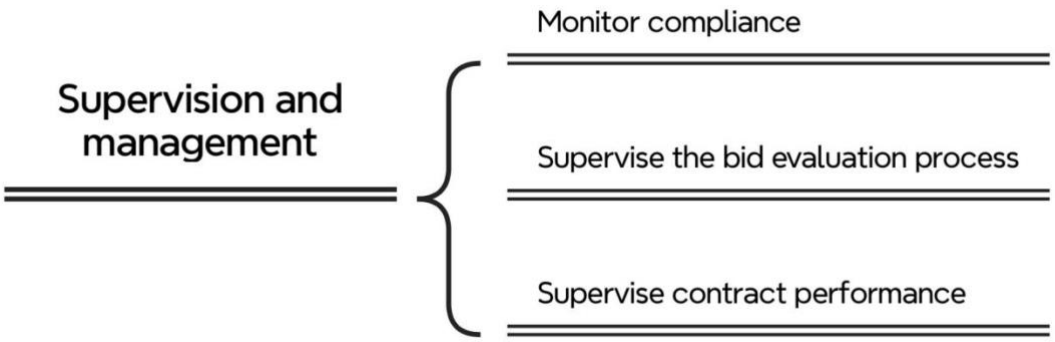


Table 7. Supervision and management system process.

Supervising compliance means ensuring that the bidding process and bidding behavior comply with relevant laws, regulations and bidding regulations to prevent the occurrence of improper behavior. Supervising the bid evaluation process means supervising the impartiality and fairness of the bid evaluation process, preventing irregular bid evaluation behaviors, and protecting the legitimate rights and interests of bidders. Supervising contract performance means supervising the process of contract performance by the winning bidder to ensure the compliance of contract performance and the smooth progress of the project.

3. Tendering risk response measures and suggestions.

Risk control can also improve the scientific level and systematic level of the project [8]. Because in a complete construction project, no matter from the perspective of engineering management or project management, risk control of the project bidding work is crucial and cannot be ignored. In construction projects, the degree of control of bidding risks is also directly related to the quality and progress of the project. Risk control ensures smooth progress of the project through strict standardization of promotion procedures. Wang Tianxiang believes that scientific operations should be carried out in terms of project risk prediction and accurate identification to improve the standardization level of bidding management. It can be seen that bidding risk management in engineering projects is particularly important.

3.1 Measures and suggestions for bidding documents in the early stage of bidding.

Before bidding, you should learn more about the bidding partners and their situation, interpret the contents of the bidding documents, find out the financial strength of the bidding unit, and comprehensively analyze the bidding documents to analyze the contract terms, technical requirements, construction period requirements and other risky parts, and then Risk avoidance issues. Analyze the background information of the engineering project and the credit status of the owner, formulate a feasibility study report for the project, and evaluate the financial status and credibility to ensure project stability and risk tolerance. Analyze the technical, economic, quality, and safety requirements in the bidding documents, and evaluate the rationality and feasibility. Label and risk assess requirements that are ambiguous, contradictory or unrealistic. Conduct research on the qualifications of bidding competitors, and formulate competitive advantages and pricing strategies that are consistent with market conditions and trends. Based on the content and characteristics of the bidding documents, potential risks such as technology, economics, contracts, and policies are identified. Evaluate and analyze the various identified risks, and evaluate their possible project impacts such as: time cost, quality issues, contract performance risks, etc. Based on the risk assessment results, formulate bidding response strategies such as price adjustment, technology improvement, contract clause optimization, etc., to ultimately reduce risks.

The following measures can be taken to prevent the risks of bid opening, bid evaluation, and bid winning: When formulating bidding documents, special attention must be paid to language

accuracy, lack of ambiguity, and consistency of technical specifications to ensure that bidders can accurately understand the requirements. Establish a fair and transparent bid evaluation process to ensure the independence and fairness of bid evaluation committee members, and promptly disclose bid evaluation results to protect the legitimate rights and interests of bidders. Bidders should fully consider costs, risks and profits when setting prices, and reasonably assess the implementation risks of the project. Fully evaluate the technical, financial and management capabilities of the winning bidder to ensure that it has the ability to perform the contract. After winning the bid, establish a contract management mechanism to ensure smooth communication and coordination with the owner and reduce the risk of project changes. Through the adoption of the above risk management measures, risks in the bidding process can be effectively reduced and the smooth progress of the project can be ensured. However, specific management strategies still require customized planning and implementation based on the particularities and specific risks of the project.

3.2 Rational analysis and decision-making suggestions for bidding strategies.

Before bidding, a set of suitable bidding strategies and decisions should be scientifically proposed based on bidding policies, actual industry development, industry market competitiveness, and the company's comprehensive strength, so as to prepare the company for smooth bidding. Formulating bidding strategies and decisions is a crucial step in the bidding process. The key steps for rationally formulating bidding strategies and decisions are as follows in Table 8:

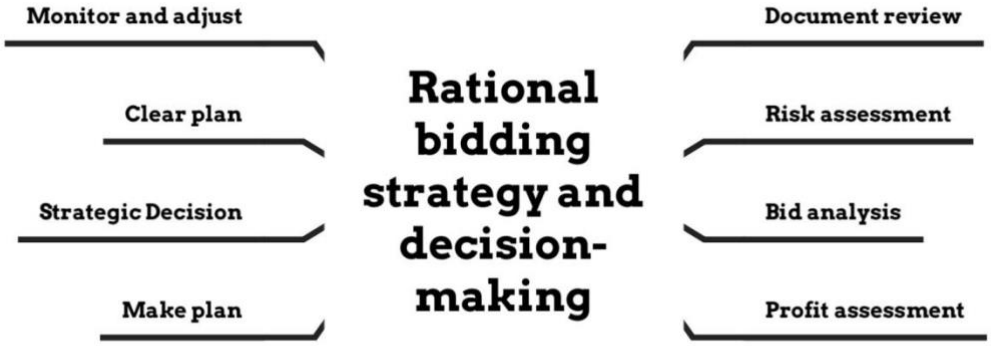


Table 8. Rational bidding strategy and decision-making steps chart.

Document review refers to reviewing the bidding document project, technology, contract, bid evaluation and other requirements, and understanding and screening the bidding requirements and restrictions to confirm the risks and opportunities of the bidding project. Risk assessment is to analyze the technical, quality, commercial, legal and market risk perspectives of the engineering project, find the corresponding advantages of the bidding companies and try to cooperate with them. Bidding analysis is to analyze potential bidding companies and compare and analyze the strength, resources, competitive advantages and disadvantages, and relevant construction experience of our company and competing companies. Make assumptions about competing companies' bid pricing levels and develop corresponding scenarios. Profit evaluation refers to the evaluation of project profits based on bidding requirements, project conditions, construction risks, and construction costs. And formulate rational bidding strategies based on profit margins, capital costs, and market competition. Developing solutions means formulating competitive technical solutions and providing added value through innovation. Optimize the construction technology plan to meet the bidding requirements and highlight the advantages of project execution. Strategic decision-making refers to making strategic decisions on bidding after considering the potential benefits and risks of cooperation with suppliers, contractors and professional organizations, and assessing whether cooperation with other organizations is needed to improve bidding competitiveness. Clarifying the plan means clarifying the final bidding plan after

comprehensively considering the above factors. Determine whether to participate in bidding, pricing, technical solutions, project risk management and other key elements, and clarify the implementation plan and timetable. Monitoring and adjustment means monitoring competitors during the bidding process, making bidding strategies and decisions based on the adjustments of competing companies, and improving the bidding success rate.

3.3 Suggestions on using the inductive method to control bidding quality and project duration.

The inductive method is to use specific engineering cases to summarize various events and the trends shown in bidding to draw conclusions. Bidding is the basic core of bidding. Integrated control of bidding quality and construction period will directly affect the overall project bidding quotation and project economic benefits.

If you want to set appropriate quality and construction period goals, you should clarify the engineering specifications, engineering requirements, quality standards, and construction period limits and other engineering goals, and formulate engineering goals based on the priority of the engineering requirements. Evaluate the technical feasibility, resource feasibility and time feasibility of the engineering project, based on the project's complexity, risk factors and constraints, to determine whether the goals can be achieved within the specified construction period.

Evaluate the feasibility of the project such as technical feasibility, resource feasibility and time feasibility. Analyze the complexity, risk factors and constraints of an engineering project to determine whether objectives can be achieved within the construction period. Determine quality factors and schedule factors. Quality factors such as product performance, stability, reliability and user-friendliness. Construction time factors such as development time, testing time and delivery time, etc. Set specific quality and schedule goals based on demand and feasibility analysis. Goals should be specific, quantifiable, and measurable, and consistent with project needs and resource constraints. And develop detailed project plans and related measures to achieve quality and schedule goals. Plan checklist such as detailed task breakdown, resource arrangement, progress control and risk management, etc. Improve project execution efficiency and quality through reasonable planning and effective measures. Finally, during the project implementation process, the project progress will be continuously monitored and evaluated, and plans and measures will be adjusted in a timely manner. Through supervision and adjustment, the project quality and construction period are effectively controlled to ensure the achievement of goals.

3.4 Suggestions on conducting behavioral science management work after bidding.

Summarizing and summarizing after bidding is an important part of construction projects. It helps achieve continuous improvement and development in construction projects, improve competitiveness, reduce risks, and promote the development of enterprises in a better direction. The summary after bidding can help bidding companies identify their own strengths and weaknesses, adjust and improve bidding strategies based on the strengths and weaknesses, and improve bidding competitiveness. Gain experience with market trends, bidding patterns and bidding techniques to use in future bids. Through the summary of risks and costs in bidding, identify risks and cost deviations, and take corresponding risk control measures to reduce the risks of bidding projects. The post-bidding summary will record the bidding documents, bidding quotations, technical solutions and other information, which can later be used as a basis for filing and certification for easy reference and verification. The summary flow chart after bidding is shown in Table 9:

Table 9. Bid summary summary process table.

4 Conclusion.

Bidding work is an important link in construction projects. Risk management of bidding work can affect quality, cost, construction period and other aspects. Moreover, construction engineering project bidding risk management helps to prevent common risks in construction engineering projects, affecting quality, cost, construction period and other aspects, and ultimately improves economic and social benefits, enhances the competitiveness of construction engineering enterprises, The goal is to improve the market economic system and combat corruption.

Analyzing from the perspective of the macro-environment, since the business behavior of the construction market has the characteristics of futures trading, that is, the contract is signed first and then production is organized. The construction company must complete various contract indicators such as construction period, quality, safety, and cost, and there are many unforeseen circumstances during the performance of the contract. risks of. Especially for comprehensive large-scale projects with large specifications, tight construction deadlines, high quality standards, special structures, different shapes, and other special needs, there are often greater risks of unsatisfactory project performance capabilities. Through the use of Gantt chart method, induction method, rational analysis of bidding strategies and decision-making suggestions, etc., we finally conduct task decomposition, resource arrangement, progress control and risk management for bidding, bidding, bid opening, bid evaluation, bid winning and other projects. This will ensure continuous improvement and development in construction project bidding, improve the competitiveness of engineering companies, reduce bidding risks, and ultimately promote the development of the entire engineering industry in a better direction.

Declaration of Competing Interest.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability Statement.

All data generated or analysed during this study are included in this published article [and its supplementary information files].

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