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Research on Refined Management and Project Risk Control  
Strategies in Whole Process Engineering Consultation

Hongji Fang<sup>1</sup>

<sup>1</sup> China International Postal and Telecommunications Exhibition and Advertisement Co., Ltd,  
Engineering Management Department, Beijing, China

E-mail: bennyfang@163.com

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**Abstract**

*Whole Process Engineering Consultation (WPEC) plays an increasingly vital role in modern engineering project management. It not only encompasses the entire project lifecycle from planning and design to implementation and operation but also significantly enhances project efficiency, reduces costs, and mitigates risks. As the complexity of engineering projects grows, refined management emerges as a crucial method for achieving efficient project management. This paper explores the application of refined management in WPEC and analyzes its role in project risk control through real-case studies. By delving into the principles of refined management, management tools, and risk control strategies, this study proposes an integrated approach to optimize project management processes and improve project success rates. Additionally, it discusses the impact of emerging technologies on refined management and risk control, providing insights into future development trends. The aim is to offer theoretical support and practical guidance for engineering project management, ensuring efficient management and risk control.*

**Keywords**

*Whole process engineering consultation, refined management, project risk control*

**1. Introduction**

Whole process engineering consultation (WPEC) is crucial in modern engineering project management. It covers the entire project lifecycle from planning and design to implementation, operation, and maintenance, aiming to enhance overall project efficiency and success rates through systematic management and consulting services. However, traditional project management methods struggle to

meet the demands of increasingly large and complex engineering projects. Consequently, refined management (RM) has emerged as a key approach, emphasizing precise control over every project detail to boost management efficiency. Meanwhile, project risk control strategies (RCS) have become more critical, helping to identify, assess, and mitigate potential risks, thus reducing their adverse impacts on project goals. Integrating RM with RCS can significantly improve project controllability and success rates. This paper aims to explore the application of RM in WPEC and its impact on project risk control. The main objectives of this research are: first, to define and analyze the core principles of RM and its practical application in WPEC; second, to investigate key project risk control strategies and evaluate their effectiveness through real-case studies; and finally, to propose an integrated approach combining RM and RCS, and to explore the influence of emerging technologies on these strategies. By achieving these objectives, this study hopes to provide theoretical support and practical guidance for engineering project management, improving efficiency and success rates. This research adopts a methodology combining literature review and case analysis. By systematically reviewing relevant literature, the paper analyzes the theoretical foundations and practical applications of RM and project risk control. Additionally, representative engineering project cases are selected to deeply analyze the practical effects of RM and RCS. The study also examines the impact of emerging technologies on RM and RCS. Through these methods, the paper aims to comprehensively reveal the current application status and optimization solutions for RM and RCS in WPEC.

## **2. Whole Process Engineering Consultation Overview**

Whole process engineering consultation (WPEC) is a service model that covers the entire lifecycle of engineering projects, including planning, design, implementation, and operation and maintenance. Its core goal is to enhance project efficiency, quality, and economic benefits while reducing risks and uncertainties through systematic management and consulting services. WPEC is characterized by comprehensive participation, integrated services, and dynamic management. Comprehensive participation is reflected in the wide range of services, including early-stage planning, feasibility studies, design optimization, construction quality control, and operation and maintenance. This full involvement ensures continuity and consistency in project services. Integrated services provide technical consultation and design solutions, economic analysis, legal advice, and risk management support, making project management more thorough and detailed. Dynamic management requires continuous tracking and adjustment at all project stages to address potential changes and challenges, optimizing project execution and ensuring goal achievement. WPEC's service content includes early-stage planning and feasibility studies, design management, construction management, and operation and maintenance. During the planning stage, reasonable project plans and budgets are developed through feasibility analysis, laying the foundation for subsequent work. In the design stage, optimization suggestions are provided, and opinions are coordinated to ensure the scientific and feasible design. In the construction stage, quality and progress are supervised, and on-site technical

support is provided. During the operation and maintenance stage, equipment inspection, maintenance planning, and implementation are conducted to ensure long-term stable operation. Compared with traditional engineering consultation, WPEC improves overall project efficiency through full involvement and dynamic management, promptly identifying and solving problems, and reducing risks. It also optimizes resource allocation and enhances economic and social benefits, providing strong guarantees for project success. Furthermore, WPEC supports sustainable development practices by incorporating environmental impact assessments and green building standards into the project lifecycle, ensuring that projects not only meet current needs but also preserve resources for future generations. This holistic approach aligns with global trends towards sustainability and responsible resource management, further highlighting the comprehensive nature of WPEC (Lindner et al., 2021).

### **3. Application of Refined Management in Whole Process Engineering Consultation**

#### *3.1 Principles of Refined Management*

Refined management is a modern management concept aimed at enhancing management efficiency through precise control and optimization of various project aspects. Its core principles, particularly important in WPEC, include clear goals, process control, data-driven decision-making, and continuous improvement. Clear goals are the foremost principle. In WPEC, detailed demand analysis and goal setting during the project's early stages ensure clear and actionable project objectives. Clear goals help coordinate all parties involved and prevent resource wastage and management confusion due to ambiguous objectives. Process control requires detailed planning and control of every project management aspect. This involves creating detailed work plans and schedules, tracking and supervising task execution, and promptly correcting deviations. It also includes reasonable resource allocation and utilization to ensure the project progresses as planned. Data-driven decision-making emphasizes using data analysis to support management decisions. In WPEC, project management software and data analysis tools monitor and analyze project indicators, identify potential problems and risks, and provide scientific bases for decision-making. For example, real-time monitoring of project progress, costs, and quality data allows timely management strategy adjustments, optimizing execution processes. Continuous improvement demands constant self-evaluation and optimization to adapt to environmental changes and enhance management levels. Regular evaluations of project implementation effectiveness, identifying shortcomings, and taking improvement measures are necessary. Continuous improvement includes process optimization and updating management tools and methods to improve overall management levels and project success rates. In summary, the principles of refined management, through clear goal setting, process control, data-driven decision-making, and continuous improvement, play a guiding and optimizing role in WPEC. They can effectively enhance project management efficiency and effectiveness, ensuring successful project implementation (Lenderink et al., 2022).

#### *3.2 Case Studies*

The application of refined management in WPEC can significantly enhance project efficiency and

effectiveness. The following two case studies demonstrate the practical effects and benefits and challenges of refined management in real-world operations.

#### **Case Study 1: Large-Scale Commercial Complex Construction Project**

In a large-scale commercial complex construction project, refined management was comprehensively applied at all stages. The project team conducted detailed demand analysis and goal setting in the early stages, ensuring clarity in project scope, budget, schedule, and technical requirements. During the design phase, the team applied refined management principles to optimize the design plan, ensuring its scientific and feasibility. Advanced project management software was used to monitor progress, costs, and quality in real time, allowing timely management strategy adjustments. In the construction phase, detailed construction plans and quality control measures were implemented, ensuring construction quality and progress. The project was completed on time and exceeded the expected quality standards, providing significant economic and social benefits to the owner. This case illustrates the value of refined management throughout the project lifecycle, enhancing overall success through precise detail control and real-time adjustments.

#### **Case Study 2: Urban Infrastructure Renovation Project**

In an urban infrastructure renovation project, refined management also demonstrated its advantages in handling complex projects. The project included road construction, drainage system upgrades, and landscaping. The project team conducted detailed process planning and set clear goals and indicators in the early stages. During implementation, a data-driven management model was adopted, with real-time monitoring of progress and quality for each sub-project. Issues were promptly identified and resolved, such as discovering and adjusting a potential design flaw in the drainage system through data analysis, avoiding construction problems. The project was successfully completed, meeting all expected targets and receiving high public and government praise. This case shows how refined management, through data-driven decisions and process control, enhances precision and effectiveness in project management, ensuring smooth and successful project implementation.

These case studies demonstrate that applying refined management in WPEC can significantly improve project management levels and effectiveness. Clear goals, optimized processes, data-driven decisions, and continuous improvement allow effective management and control at all stages, avoiding problems that might arise from traditional management methods. This enhances project quality and economic benefits and strengthens the management and coordination capabilities of the project team. However, implementing refined management also faces challenges such as high management costs and technical support requirements. These case studies provide valuable insights and references for future project management, helping to further optimize the application of refined management (Ferdosi, Reza, & Yasamin, 2020).

## 4. Project Risk Control Strategies

### 4.1 Risk Identification and Assessment

In WPEC, risk identification and assessment are crucial for project risk control. The objective is to systematically discover and evaluate factors that may negatively impact project goals, helping the project team to anticipate potential issues and develop strategies to mitigate risks. Risk identification is the first step, involving systematic methods to discover potential risks. This includes information gathering, creating a risk list, and risk classification. The team collects relevant data and experiences through surveys, literature reviews, and expert consultations, such as analyzing success and failure cases of similar projects to uncover potential technical, managerial, market, legal, and financial risks. Then, a detailed risk list is compiled, and risks are classified by source and nature, such as internal vs. external, controllable vs. uncontrollable, etc. This classification helps systematically analyze each risk's characteristics and impacts, laying the groundwork for subsequent assessment and management. Risk assessment involves a thorough analysis of identified risks, including evaluating their likelihood and potential impacts, and prioritizing them. The team assesses each risk's occurrence probability and impact level, often using risk matrices or scoring tables for quantitative analysis. For example, through historical data and expert judgment, the team can determine the likelihood of technical failures and their impacts on project cost, schedule, and quality. Based on the assessment results, risks are prioritized, focusing on those with high probability and high impact. This aids in rational resource allocation and focused risk management. Additionally, sensitivity analysis identifies which risk factors have the most significant impact on project goals, highlighting areas requiring special attention (Zhuo, 2023). Following risk identification and assessment, the team must develop a detailed risk management plan, including risk response strategies, monitoring mechanisms, and communication training. For high-priority risks, specific response strategies should be devised, such as avoidance, transfer, mitigation, or acceptance. For instance, high-probability technical risks can be addressed through technical verification and trials, while uncontrollable market risks can be transferred via insurance or contractual terms. Establishing a risk monitoring mechanism ensures regular tracking and assessment of risk changes, enabling timely strategy adjustments. Additionally, training enhances the risk awareness and response capabilities of the project team and stakeholders, improving risk management effectiveness. In summary, systematic risk identification and assessment provide a comprehensive understanding of potential risks, enabling the project team to develop effective response strategies, thereby increasing project success rates and reducing uncertainties and risks during implementation.

### 4.2 Risk Control Measures

Risk control measures in project management aim to address identified and assessed risks to reduce or eliminate their impact on project goals. Effective risk control measures ensure smooth project progress and mitigate the negative effects of potential issues. Common risk control measures include risk avoidance, transfer, mitigation, and acceptance. Risk avoidance involves adjusting project plans or strategies to prevent certain risks. For example, if a particular technology poses significant risks, the

project team might choose alternative technologies or modify project goals to reduce the likelihood and impact of technical risks. This measure optimizes project design and implementation plans, avoiding potential major risks. Risk transfer shifts the responsibility or impact of risks to other parties, such as through contracts, insurance, or outsourcing. For example, risks can be transferred to suppliers or contractors through contractual agreements, or financial risks can be transferred to insurance companies through insurance policies (Ferreira, Priscila, Sara, & Chiara, 2021). This measure helps distribute and minimize the impact of project risks. Risk mitigation involves various measures to reduce the likelihood or impact of risks. Establishing strict quality control systems, conducting technical verifications, and optimizing project processes can all mitigate risks. Regular risk assessments, developing contingency plans, and implementing monitoring measures ensure risks remain within acceptable limits. Risk acceptance refers to deciding to accept certain risks after assessment and preparing measures to handle potential impacts. This is suitable for risks with low probability or minor impact or for risks that cannot be completely eliminated by other measures. In such cases, the project team should develop contingency plans and take swift remedial actions when risks materialize. Implementation and monitoring of risk control measures are also crucial. After implementation, monitoring mechanisms should be established to regularly check and evaluate the effectiveness of the measures, making timely adjustments and optimizations. Additionally, maintaining communication with stakeholders ensures all parties are informed and involved in the risk management process. In summary, through risk avoidance, transfer, mitigation, and acceptance measures, the project team can effectively address various risks, enhancing project success rates and management levels while minimizing negative impacts on project goals.

## **5. Integration of Refined Management and Risk Control**

### *5.1 Interaction of Management and Control*

The effective integration of refined management and risk control is key to project success. Their interaction not only enhances project execution efficiency but also effectively addresses various risks during implementation. Refined management involves detailed planning and control of various project aspects, ensuring clear goals, process optimization, and reasonable resource allocation. This management approach focuses on details, using systematic process design to improve overall project efficiency and quality. Refined management emphasizes a thorough understanding and control of the entire project process, developing detailed plans, setting clear goals, and employing data-driven methods for continuous improvement, laying the foundation for project success. Risk control, on the other hand, focuses on identifying, assessing, and addressing potential risks to reduce their negative impact on project goals. It includes risk identification, assessment, response, and monitoring, with systematic risk management reducing the likelihood of risks and potential losses (Yap, Jeffrey, & Martin, 2020). The core of risk control is predicting problems and developing strategies to ensure project progression amidst uncertainties. The interaction of refined management and risk control is

evident in several ways. First, the goal setting and process planning in refined management provide a foundation for risk assessment. Detailed plans and clear goals help identify potential risks and conduct effective assessments. Second, process control measures in refined management support the implementation of risk response strategies. Real-time monitoring and data analysis can identify risks promptly, prompting the team to take response measures and reduce risk impacts. Finally, the continuous improvement principle of refined management complements the dynamic adjustment in risk management, enhancing the effectiveness of risk management and project responsiveness through ongoing optimization. In conclusion, the integration of refined management and risk control requires the project team to focus on their interaction and coordination. Refined management provides precise control, while risk control offers response strategies. Their combination significantly improves project management levels, enhances risk resistance capabilities, and ensures successful project implementation.

### *5.2 Optimization Strategies*

Effectively integrating refined management and risk control in project management is crucial for improving project success rates. To achieve this, optimization strategies such as process optimization, resource allocation optimization, technical support optimization, and communication coordination optimization must be developed and implemented. Process optimization is fundamental. By analyzing and improving project management processes, operations can be simplified, complexity reduced, and efficiency enhanced. For example, standardizing processes and templates ensures consistency and standardization, reducing risks. Introducing project management software and data analysis tools can enhance process automation, real-time project monitoring, and strategy adjustment, increasing risk early warning capabilities. Resource allocation optimization is also a key strategy. Reasonably allocating human, material, and financial resources ensures necessary support for all project stages. Training teams in essential skills, optimizing material procurement and supply chain management, and controlling budgets and costs all enhance project execution efficiency and risk response capabilities. Technical support optimization improves management outcomes through advanced technology applications. Big data and artificial intelligence technologies improve data processing and risk assessment accuracy. Project management software and collaboration platforms enable real-time project progress, cost, and quality monitoring, quickly identifying and addressing risks. Establishing a comprehensive technical support system provides timely technical assistance, enhancing risk response capabilities (Erol, 2022). Communication coordination optimization enhances team collaboration efficiency. Establishing clear communication channels ensures accurate information transmission and feedback. Regular project progress meetings and risk assessment discussions promote information sharing and problem-solving, reducing risks from delayed or misunderstood information. In summary, optimizing processes, resource allocation, technical support, and communication coordination effectively enhances the integration of refined management and risk control. This boosts overall project efficiency and risk resistance capabilities, ensuring smooth project progression and achieving expected

goals.

## 6. Future Development Trends

In WPEC, the effective integration of refined management and risk control will continue to elevate project management levels. Future developments will focus more on intelligent management, data-driven decision-making, and interdisciplinary integration. Intelligent management will be a key trend. With advancements in artificial intelligence (AI), machine learning, and automation technologies, project management will become more intelligent. Intelligent tools can analyze data in real-time, predict risks, and provide optimization suggestions, improving management efficiency and foresight. For example, AI can identify risk patterns through big data, helping teams take preventive measures in advance, while automation tools simplify processes and reduce human errors. Data-driven decision-making will be the core. With advancements in data collection and analysis technologies, project management will rely on data-driven decisions. Real-time data analysis can accurately identify and assess risks, optimize resource allocation and process control, and enhance project efficiency. For example, data-based risk assessment models can offer precise risk predictions, aiding in the formulation of effective response strategies. Interdisciplinary integration will also be a development trend. In complex projects, combining knowledge from engineering management, systems engineering, information technology, and economics can provide more comprehensive solutions. This integration enhances the depth and breadth of management, helping address complex challenges and fostering innovative thinking in interdisciplinary teams. Sustainability and green management will increasingly gain attention. With growing awareness of environmental protection and the promotion of sustainable development concepts, project management will focus on environmental impact and resource utilization sustainability. Emphasizing green building design, energy conservation, and resource recycling can reduce environmental burdens while achieving economic and environmental benefits. Overall, future refined management and risk control will be more intelligent, data-driven, and interdisciplinary, promoting innovation in the WPEC field and enhancing overall project management levels and outcomes (Mouras, & Adel, 2020).

## 7. Conclusion

In WPEC, the effective integration of refined management and risk control is crucial for project success. Refined management enhances project efficiency and quality through detailed planning and process control, while risk control reduces uncertainties and negative impacts by identifying, assessing, and addressing potential issues. Their combination improves detailed project control and risk response capabilities. In the future, advancements in intelligent technologies, data analysis capabilities, and interdisciplinary applications will make refined management and risk control more intelligent and data-driven, presenting new challenges and opportunities. In summary, integrating refined management and risk control effectively can increase project success rates and provide strong assurance for smooth



project implementation.

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