

Risk Pre-control on Multi-project Management for Large-Scale Construction Enterprises

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Abstract: Multi project risk management of large-scale construction enterprise is a complex, huge and dynamic systematic engineering. Besides, risk factors are on a constant change along with the passage of time. Thus, constant feedback and improvement of the project based on risk identification and control is vital. Aimed to improve the risk control level, this paper constructed both organization system and integrates system of multi project risk warning system and put forward corresponding countermeasures.

Key words: Multi project management; Risk warning; Risk integration; Risk control

1 Introduction

Compared with single-project management, multi-project management is more complicated which has more relationships to deal with. Large-scale construction, both capital-intensive and technology-intensive, is a typical high-input and high-risk project. It has the features of high integration, high quality, long construction life and involving many domains. Portfolio of projects' value maximization, portfolio balance and guarantee of consistency with organization are the main goals of multi project management^[1]. Compared with single project, multi project is of more complexity and of more uncertainty. Thus, multi project management is facing more risks. Generally, multi project failure comes from two aspects; one is the lack of risk assessment of single project and the other is the imperfection of overall evaluation of multi project risk^[2]. However, researches on risk management of multi project are absent. Anuradha Rajapakse (2006) used prototype software tool to analyze the gains and risks of portfolio in order to lower the risk of biological pharmaceutical project portfolio^[3]. Aimed at engineering and contracted projects, Franco Caron (2007) analyzed the risks in portfolio balance process and constructed a portfolio balance model with value at risk method^[4]. RolfOlsson (2008) put forward an approach to evaluate the risk of multi project which contains 3 steps. That is, exploring the problems of each single project first, and then analyzing those problems compared with other projects, thirdly analyzing those problems more deeply in accordance to the data of all risks^[5]. Based on interdependence model and (system-environment model, Hynuk Sanchez (2008) established a frame to identify possible risks and opportunities in multi project^[6]. Accordingly, no matter what method is being used, quantitative or qualitative, existing methods are passive management, instead of dealing with the risk positively such as analyzing the risk from the perspective of the nature of risk. Thus, taking large-scale construction enterprise as the subject, this paper explored pre-control measures of multi project.

2 Early Warning Management of Multi-project

2.1 The theoretical framework

The early warning management of multi project refers to the monitoring, identification, diagnosis and evaluation of possible risks during the construction progress.

Monitoring is to reflect the risk symptoms of engineering by warning signals; identification is to analyze existing risk factors and underlying risk factors; diagnosis is to analyze the cause and formation of the risk and to predict the evolution of the risk; evaluation is to calculate the possible lost when the engineering suffers^[7].

To be specific: Planning and decision-making phase. During this stage, the main task is to design corresponding risk countermeasures in collaboration with the owner such as project assessment, feasibility study and the acquisition of official reply documents.

Preparation phase. The main tasks contain tender and bid assessment review and engineering change such as the selection of suppliers, contractors and supervision companies and the building of project management organizations.

Implementation phase. The main tasks are the input of organization resources and realizing of intended goals. To be specific, the early warning management is focused on the supervision of schedule and quality of the project, the coordination and control of sub-project, and dealing with emergencies

during the construction.

Completion and summary phase. The main task it to follow up the influence of the project such as the evaluation of environment and safety, commissioning and joint debugging of the project and operation inspection.

2.2 The operation

Involved in the large construction projects, participants include the owners, design units, construction units, suppliers, consultants and other supervisory stakeholders. These construction projects are generally large-scale and complex, all companies and units are closely linked to each other and build a complex project management framework. Multi-project risk early warning system is a coordination and communication platform for the organization, which is established by multi-project management office. With the help of the owners, contractors, supervisor in strengthening risk control function, it can weaken or even eliminate the risk of the project through early warning analysis and timely pre-control measures [8]. Multi-project risk early warning system could take emergency measures to reduce losses to a minimum in the event of major emergencies. As shown in Figure 1.

In the multi-project early warning system, the multi-project management office is in charge of each project's overall progress, quality, safety and costs. It makes sure every unit collaborates with each other in project duration, cost, and quality and safety goal. The office is responsible for multi-project risk management. Establishing an early warning department in the system will be more targeted surveillance of risk factors, recognition, diagnosis and evaluation, and make risk work more targeted and preventive. Different contractors, owners and sub-department are in charge of the normal project management, form a good interaction with multi-project management office in risk warning. When a major unexpected events happens during the progress of the project, the risk emergency immediately start, which requires all units to respond rapidly. While dealing the emergency quickly, they should report to the headquarters and the local production safety supervision and administration department in accordance with procedures.

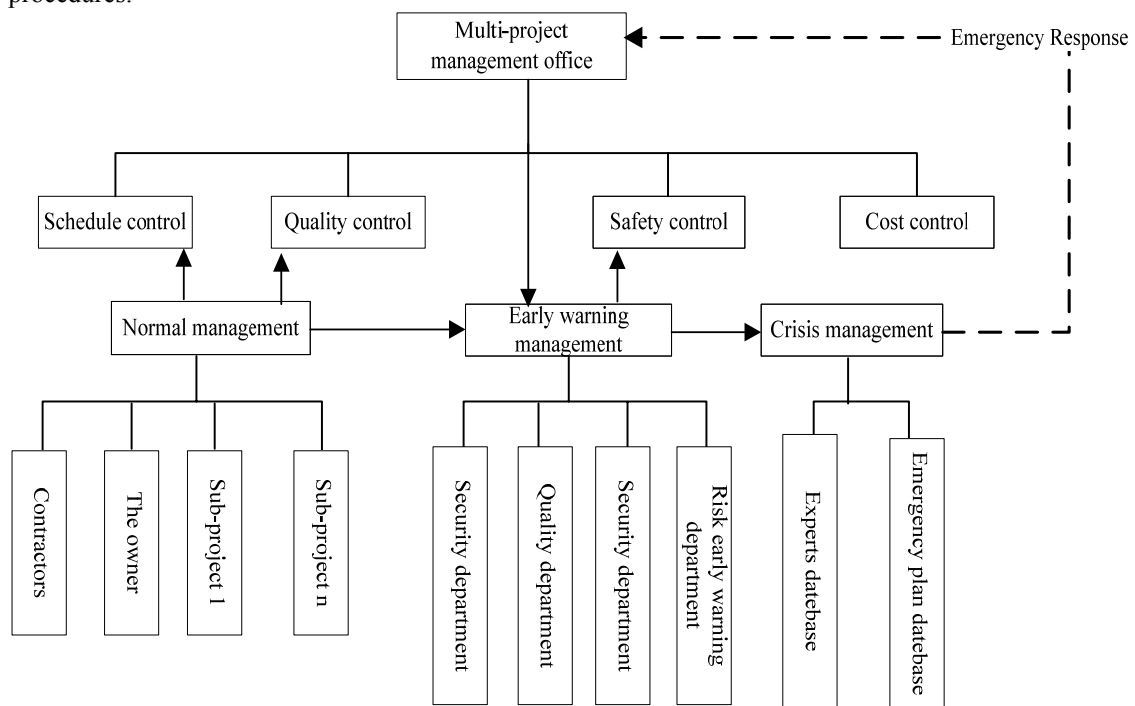


Figure 1 Multi-project Risk Early Warning System of Large-Scale Construction Enterprise

In the multi-project early warning system, multi-project management office needs to find a communication way between different projects and establish information exchange platform to avoid every project battle for public resources which will affect multi-project implementation. How to form coordination mechanism among multi-project management office and different sub-projects, regular meeting and institution can be used for the coordination. In addition, it needs to communicate with contractors, owners and other stakeholders.

3 Multi-Projects Risk Integration

Large-scale construction multi-projects are often with more complex internal structure and varied composition, the risk is more complex than the general single project. Risks may come from each project, or caused by different projects interaction. These risks will affect each sub-project and gradually spread. Therefore, to integrated manage and control these risks is important work of multi-project risk management.

Multi-project risk integration is a process to conduct a comprehensive risk management to subprojects, the owners and other stakeholders. The key to conduct risk integration is to build an integrated platform, which is the information exchanging, processing and storage place among units and also the owners' risk information storage and management platform. It is an important condition to conduct overall risk management. Based on the multi-project risk integration management platform, risk integration process and system shown in Figure 2.

Multi-project risk integration management is to build a major risk-sharing mechanism. In the whole multi-project process, different stakeholders unite through a certain mode of cooperation and mutual trust mechanism and achieve integrated control of project risks by information exchanging and resource sharing. In this process, reasonable allocation of risks and benefits of the project are particularly important. In order to achieve the overall goal of multi-project, multi-project management office need to collaborate with different participants for scientific monitoring and management. In the centralized management platform, it needs to focus on the following aspects:

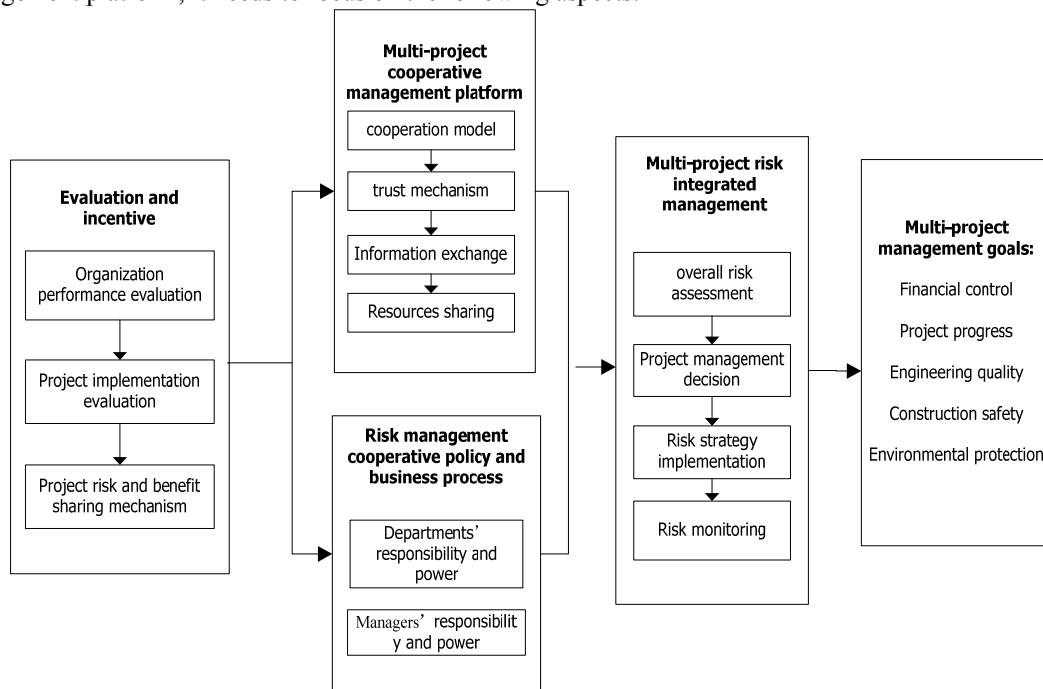


Figure 2 Multi-project Risk Integration System of Large-Scale Construction Enterprise

Multi-project management office organizes relevant meetings on a regular basis and communicates with stakeholders timely so that participants are able to receive useful information;

Multi-project management office is responsible for coordinating stakeholders about conflicts and disputes; especially when risk occurs only in a project, the office should reasonably distribute public resources and prevent risk transference between projects;

Multi-project management office establishes scientific project risk bearing mechanism and risk controlling process to enhance the participant's constraints.

4 Risk Control of Multi-project

Through evaluation on multi-project risk of construction, We can determine the level of different risk factors, and establish the risk prevention and control system based on risk integration platform of multi-project organization. It can reduce risk losses expected, and achieve the maximum benefit in minimum cost.

It needs the scientific process of risk control and complete risk control measures which establish effective risk prevention and control system.

4.1 Risk Control Processes and Strategies

All studies about project risk of large construction enterprises before, aimed to achieve good risk control. Based on the experience in project management, we recommend the following risk control procedures: ① Before the project start, we need set out the relevant risk factors and included them in the proposed control scheme. At the same time, establishing a risk control group and a person in charge is necessary. ② Ready for mobility to ensure the smooth flow of information when the project starts; ③ Develop document standards of risk management and establish a mechanism to ensure the documents be produced timely; ④ When risk occurs, take the appropriate risk control measures based on the level and types of risk; ⑤ Make the tracking of event t and major risk factors at multi-project milestones to re-evaluate the risk; ⑥ Keep the collection of risk factors information in the risk control process and provide information and program databases for the early warning of risk management.

We also need adopted risk response strategies beside follow the risk control process. There are risk aversion, risk transfer, risk self-retention, risk reduction and risk prevention in multi-project risk control strategies of large construction enterprises. After identifying the level of risk, it should decide the type and degree of control measures.

The strategy of risk aversion means that give up part of the project actively or change target scheme of the multi-project when the potential threat of risk is significant, risk consequences is serious and no other strategy options.

The risk transfer strategy means transferring the possible risks of project to other persons or organizations which probably involved in multi-project, social risk coverage or other institutions. Risk transfer can be classified as financial risks transfer and non-financial risk transfer. Financial risks transfer mainly transfer the risk such as risk loss coping force majored to commercial partners by insurance companies and other intermediaries. Non-financial risk transfer generally reflected that transfer risks business associated to other persons or organizations by the form of contact in the multi-project management.

The risk self-retention strategy means that the risk consequences are taken by multi-project organizations consciously. Multi-project organizations can take this strategy when they think some risks will not be affected the progress of the project and they have capable of resolving these risks completely.

The risk reduction strategy means we take appropriate contingency measures in advance according to risk regulation of multi-project construction. Once the actual progress of the project is not the same with the plan, contingency plans can be used to reduce the risk of losses caused by the occurrence.

The risk prevention strategy is a proactive risk control strategy, such as eliminating the threat of physical risk using engineering method in the multi-project management of construction enterprises, that means contacting each specific measures with engineering facilities by engineering technology; or constraining multi-project activities by programmed system.

4.2 Risk response

4.2.1 Risk response of multi-project organization

In the multi-project management of large construction companies, risk may exist in all stages and aspects of the processes of multi-project management. But the functions and works of the risk management scattered in all aspects of multi-project management at present. It will lead to risk liability is unknown when responsibilities are not clearly, and also lead that the efficiency and effectiveness of risk management are greatly reduced. To solve these problems, we can respond in two ways:

Set up multi-project risk management department to take charge of multi-project risk management and bear all risk of liability. This department is tied for other functional departments like the finance department and materials department, it also owned the rights of decision-making in project management. In the multi-project management, enterprise give multi-project risk management department the status of supervision and make it be responsible for the overall risk of multi- projects, and review the health situation of each project. It requires a global point of view to the enterprise multi-project risk. In addition to collecting risk data and information, this department also should have a full and comprehensive understanding on the knowledge of system principles, structure and operation.

As for the actual organization structure situation of project group in large construction enterprises, the misconduct of centralization and decentralization exists when selecting an organization structure that suits business strategic development. On the one hand, multi-project group headquarter cannot effectively transfer resources of various sub-projects, and departmentalism of various sub-projects is so

serious that project headquarter cannot play the role of resource hub. Considering specific circumstances of construction project multi-project enterprises and reasons such as geographical distribution between various sub-projects, production technology level and management pattern, different management patterns can be used in different stages of multi-project manage. Organization structure based on U-shaped structure can be used at the beginning of project, thus multi-project management organization can work as the core of project group management, so as to take the advantage of core headquarter in information, technology, integration of external resources and personnel deployment, coordinate conflicts among sub-projects, and ensure the realization of overall benefits of enterprise. In later stages of multi-project management, organization structure based on H-shaped structure can be considered, and delegate power appropriately, thus can use the right of various projects themselves on daily production operation, while headquarter retains decision-making power and veto power to major issues.

4.2.2 Financial risk response of multi-project

In risk management of large construction enterprises, developing effective project cost planning control is the most effective to tackle financial risk. It mainly covers three processes such as resource planning, cost estimate, cost budget and so on. Resource planning is to determine material resources and requirements of each resource needed to complete project activities. Resource planning specifically involves work breakdown structure, historical information, scope statement, organizational policies, etc.; cost estimate is to conduct a quantitative estimation for cost needed to be paid for project implementation, whose key is to estimate resource expenses required to complete the project, sometimes non-project expenses are included; cost budget is a plan to allocate resources and constrain project management arrangements of managers, generally based on cost estimate, work breakdown structure and project schedule. Project cost planning control is intended to minimize project cost as possible. Specific work includes: monitoring costs implementation and finding out the reasons why actual expenditure exceeds budget; preventing unreasonable or unapproved changes be included in cost reference; limiting expected costs to an acceptable range and so on. In short, coping financial risks of multi-project needs to do cost control work well so as to grasp the overall cost of the project. Take project schedule as the basis of cost budget of each subproject to maintain the rigidity of cost budget, and analyze cost variation appeared and take corrective measurements to ensure the effect of cost control.

4.2.3 Schedule risk response of multi-project

As multiple projects are parallel and correlations among projects are relatively high, schedule management exists relatively large risk in multi-project management. To solve this problem and decrease the loss caused by schedule risk to a minimum level, risk management targeting at schedule plan should be conducted reasonably, specific tackling scheme includes: first, optimize multi-project network schedule after working out schedule plan for various projects, combining internal and external conditions of projects. Multi-project network schedule optimization mainly includes optimization of duration and cash flow. Duration optimization is to shorten construction period as possible in an expected duration range, while cash flow optimization is to find the duration with the least cost and ensure there is sufficient cash flow in project construction, thus achieve optimum economic benefit through the optimization of schedule plan. Second, project schedule control can flexibly adopt the management method of compressing the duration of key activities, which requires to redistribute human and other resources, change the sequence of activities and fast tracking, etc., also requires to coordinate closely with the whole, scope and contract changes and so on related solutions. Furthermore, multi-project schedule risk management is a comprehensive optimization result on the basis of schedule management of various subprojects, thus change of subprojects will affect multi-project scheduling, and multi-project schedule requirements will adjust subprojects, therefore an effective information feedback mechanism is needed to be built.

5 Conclusions

According to current lack of multi-project risk management, this paper built a risk early warning and control system for multi-project management, including risk early warning organization operating system and risk integration platform, as well as corresponding risk control processes and measures, then proposed specific countermeasures according to organizational risk, financial risk and schedule risk that may occur in multi-project management process. This paper took large construction companies as research object, which not only offered a basis to improve the enthusiasm and initiative of multi-project risk management, but also ensure the improvement of project management level with excellent reference

value.

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