

Perspective on Supply Chain Management for Construction Engineering Management Risk Prevention

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Abstract. With the continuous development of China's economy, the competition among enterprises in various industries is becoming fiercer, the construction industry is no exception, and how to improve their competitive advantages in the fierce competition is the main problem of current construction enterprises. Implementing supply chain management in construction enterprises can effectively improve the competitiveness of enterprises and help enterprises achieve economic benefits. The management level of the supply chain has a great impact on the quality of construction projects and has certain risks, construction enterprise must guard against these management risks. This paper analyzes and discusses these problems.

Keywords: supply chain, construction engineering, risk prevention.

1. Introduction

The large-scale and irreversible characteristics of construction projects determine the complexity of project management; construction process requires multi-department collaboration; this characteristic also brings a higher difficulty to construction project management. Every construction project generally needs to go through planning, design, bidding, purchase, construction and operation and maintenance, construction is carried out under the resource's constraints. The uniqueness of construction engineering and the inherent construction mode for a long time have led to many difficulties and problems, looking for an effective way to control the difficulties and risks in the construction management process, which has become one of the research hotspots of many scholars.

The supply chain management thinking of the manufacturing field is introduced into the construction project management, the supply chain management thinking is used to solve the problems in the project construction operation, and it can better connect all the participants of the project, and handle or transfer project risks timely. The supply chain in the traditional manufacturing industry field refers to control of information flow, logistics, capital flow, and starts from raw materials, making intermediate products and final products, and finally the sales network sends products to consumers, then all the participants in this process are connected into a whole functional chain structure. Therefore, the supply chain of a construction enterprise refers to the control of information flow, logistics and capital flow, from the purchase of the construction materials to the completion of the part project, the completion of the project and the later use and maintenance of the construction products, in this process, material suppliers, engineering subcontractors, labor subcontractors, equipment leasing enterprises, and all other participants in the project are connected into a functional network chain structure. This paper analyzes the project management risks in combination with the theory and methods of supply chain management.

2. Connotation of Construction Supply Chain

2.1 Definition of Construction Project Supply Chain

In the construction of the project, the core contractor control information flow, logistics and capital flow, and integrate the consulting company, the designer, the design subcontractors, the material suppliers, the engineering subcontractors and the labor services, and form complete supply and demand network model. The supply chain management of construction projects refers main contractor as the core, adopting a win-win business strategy for designers, contractors, owners and suppliers, with the help of advanced information technology, integrated and unified management are

carried out for all activities and participants involved in the production process of the construction project., etc. The supply chain management not only emphasizes the inter-departmental integrated management within the enterprise, but also emphasizes the integrated management of with external companies. By establishing common strategic goals among enterprises, perfect trust and cooperation mechanisms, collaborative work patterns and information sharing mechanisms, the enterprise can improve performance and respond quickly to customer needs, thereby enhancing our core competitiveness.

2.2 The Composition of the Construction Supply Chain

Broad-sense construction supply chain starts from specific project needs, through the preparation, implementation, acceptance, delivery and use stage, until the expansion and demolition of the later stage of the building and other related organizational activities. The narrow-sense supply chain is based on the needs of the owner and takes the general contracting as the core; it connects the engineering material supplier, mechanical equipment supplier, designer, subcontractor, consulting company and owner into a network through information flow, material flow and capital flow.

2.3 Characteristics of the Construction Supply Chain

Each project in the construction supply chain have different requirements for the project construction, which drives the flow of information flow, capital flow and material flow in the project supply chain. The relationship of the various enterprises in the supply chain ends with the completion of the project, which has certain dynamics; moreover, because the enterprises are not very close, it has a certain temporary nature. There are many risk factors in the supply chain of the construction project, which will reduce the production efficiency of the construction supply chain, therefore, it is necessary to cooperate and negotiate with the enterprises to complete the project better.

3. Advantages of Supply Chain Management in Construction Projects

Modern construction enterprises pay more and more attention to the competition of customer response time and construction time, after implementing supply chain management, construction enterprises can reorganize and integrate production process by removing some duplicate links and process, and implement multiple projects at the same time, which can greatly reduce unnecessary waiting time and consumption, thus speeding up the construction progress. Construction project supply chain is a supply network of construction products and services based on reasonable division of business and long-term partnership, this cooperation based on enterprise core competence and specialized division of labor will greatly improve the business competence of each supply chain member, improve the skilled degree and technical level of workers, and continuously improve the engineering quality of construction project. In addition, supply chain management of construction projects reduces uncertainties through information sharing, which leads to supply delay and interruption of upstream enterprises in supply chain, and increases construction costs in downstream enterprises due to stopping work and waiting for materials, it reduces construction costs and reduces risks through integrated management and coordination of supply chain.

4. Risk Analysis of Construction Project

4.1 Overview of Construction Project Risks

The project approval, feasibility study, planning and design of the construction project are based on the prediction of the future situation, and in the actual implementation and operation of the project, these factors are likely to change, and these changes will interfere with the original plan. These previously undetermined internal and external disturbance factors for construction projects are called construction project risks, these risks lead to the extension of the construction period, the increase of costs, the revision of the plan, and ultimately the economic benefits of the project are reduced, and even the project fails. Modern construction projects are characterized by large scale, novel technology,

long duration, many participating units, and complex environmental impacts, any one of the activities or changes in any party involved in the project construction will affect the activities of the relevant parties. The construction process of construction project is actually a process full of uncertainty and risk; effective risk control will be one of the key elements for the success of construction project management.

4.2 Major Risk Analysis of Construction Project

4.2.1 Risk of Material Purchase

Timing, purchase place and purchase times control in the purchase process of building materials will cause material purchase risk in external project contracting. In the whole life cycle of a project, purchase involves a long-time span, which plays a vital role in the progress, quality and cost control of the project, only by strictly grasping the purchase link and controlling the purchase risk, can the goal of construction progress, quality and cost be more effectively supported.

The raw materials needed in the construction site of the project are limited by the conditions of site, capital, and building performance and so on; it also puts forward high-level requirements for the purchase batch and quantity of construction materials. If the materials cannot be supplied in time and cannot meet the construction progress and quality requirements, it will inevitably lead to adverse consequences. If we store material as much as possible for supply at any time, on the one hand, the cost of stock increases, on the other hand, because a large number of raw materials purchases occupies additional funds, which because circulating capital cannot to be allocated more reasonably, potentially increasing logistics costs. Another problem in the purchase process of building materials is the kinds of materials and their functions, which makes it difficult to select suppliers. Different building materials need to be purchased from different suppliers; quantity, quality and performance require many inspection processes to complete, it will take time and effort. Moreover, the prolongation of purchase time will affect the timely supply time of materials, and also affect the construction progress, quality and cost of the project, and delay the project date.

4.2.2 Risk of Natural Condition

Natural condition risks refer to the factors that may have adverse effects on project construction, such as geological hazards, bad weather, interference sources around the project and bad transportation conditions. For example, unpredictable geological disasters such as earthquakes, debris flows, and abnormal bad weather such as rain, snow, freezing and bad transportation conditions may cause supply disruption, etc. According to the risk theory of project management, the risk brought by natural conditions belongs to the risk of force majeure. These risks are the most unpredictable and the most difficult to control.

4.2.3 Risk of Project Information Flow

Informatization of construction projects has been widely used; at present, BIM-based life-cycle information integration and collaborative management make information flow risk of construction projects reflect new characteristics. The risks in the process of information management are mainly reflected in the following aspects: First, the delay and inaccuracy of information transmission are caused by the separation of construction management units and construction sites. Second, the construction period of the project is relatively long, usually needs at least two to three years to complete, during this period, different construction units will be responsible for the foundation, main body, installation, decoration and so on, relevant information is stored in the various participants, and the sharing and coordination of information is not smooth, which affects the completeness of information retention, the relevance of information processing and the timeliness of information records, These are the key factors of project construction quality, schedule and cost control. Third, information system cannot take into account both sharing and security, according to the study of practical application, the construction of information system is limited by funds and technology, and its security has great hidden dangers. Fourth, the efficiency of information system communication is low, at present, the main communication way among project participants is still relying on the traditional paper way, which leads to low efficiency of information communication, delays the

progress, and it is not conducive to the realization of project construction objectives. Fifth, the applicability of information is poor, and it cannot be well screen out the complete information needed by a party in the project management database.

5. Application of Supply Chain Management in Project Risk Control

5.1 Establishment of Supply Chain for Construction Project

According to the current experts' research on engineering supply chain, the construction project supply chain can be divided into two levels. The first level is that requirement of a specific project in a construction project as the goal, raw material suppliers, component suppliers, professional subcontractors, contractors and project owners constitute the engineering network organization, it is a professional engineering supply chain serving the construction project. The second level, namely from the perspective of the whole life cycle of construction projects, the process chain of production and operation activities of construction projects are puts forward, which is divided into the effective demand stage of owners, the design stage, the construction stage, the delivery, operation and maintenance stage, the renovation and renewal stage, and the waste disposal stage.

5.2 Risk Control Analysis

5.2.1 Purchase Risk

Establishing an appropriate supply chain for construction projects can effectively reduce the purchase risk. Specifically, through the evaluation of existing suppliers, suppliers with long-term stable raw material and good performance, the project side can establish strategic cooperation, and form an efficient long-term cooperation supplier system. On the one hand, the small batch and multi-batch purchase can greatly reduce the storage cost of the project and reduce the risk of material expiration quality not meeting the requirements. In addition, the strategic alliance relationship with suppliers can ensure the quality and performance of materials, gradually reduce the quality inspection process of products, form mutual trust and interdependence strategic cooperative relationship reduce transaction costs, and ensure the quality, thus promoting the improvement of construction progress and construction quality.

5.2.2 Information Risk

Informatization of construction project is not only the application of project management information system, but also the objectives of construction project. Through the construction of supply chains of construction project and production operation process chain, information standards can be unified, from point to line, from line to network, and efficient information transmission, sharing, collaboration and utilization mechanism can be formed to effectively reduce information risk. At the level of production and operation process chain, logistics chain, information chain and value chain in different directions have been formed in the whole supply chain system. Seeking the information needed by a problem or a party from different chains is more specific, thus meeting the characteristics of the applicability of project information. According to the theory and method of supply chain management, modern information technology is embedded into the construction mode, business process, management mode and organization mode of construction project, and the information management system suitable for construction project is developed and applied to realize the information collection management of the whole process of construction project. In order to improve the level of project information management, strengthen the implementation control of the project, and reduce the risk of information transmission.

6. Application Status and Prospect of Supply Chain in Risk Control of Construction Projects

Considering the current situation at home and abroad, due to the characteristics of construction projects and the imperfection of supply chain management theory and methods, the application of

supply chain in construction project management is not extensive, which is mainly in the integration of project participants, as well as the purchase and storage of construction materials. In the application of these two aspects, the supply chain of construction project plays a more effective role in controlling risks, and promotes the realization of project cost, schedule, quality and other objectives. Information technology is the core means of supply chain management, as well as in project risk control based on supply chain. Through the construction of computer network, information exchange and management platform, decentralized construction project participants can be integrated into a virtual collaborative management platform, which increases the transparency of information and the degree of information sharing, improves the accuracy of process control, and it is conducive to the construction of projects.

The integrated research of purchase, transportation, and stock and project management based on supply chain will be an important direction of project risk control research. From the purchasing point of view, the supply constraints of materials are incorporated into the project plan, the supply chain management and the critical chain method are integrated, and the purchase time plan is optimized to better coordinate with the project scheduling, and the risks and uncertainties in the project value chain can be better managed. Future research will gradually incorporate various constraints of the supply chain activity process into the project plan, and its integration and optimization will be more difficult. In addition, more relevant value chains, logistics chains and information chains should be established in the supply chain, so that the influencing factors of project risk can be analyzed more concisely and clearly.

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