

Construction Management Mode Innovation Based on Node Method Project Management

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ABSTRACT

In the era of rapid development of science and technology, the level of construction technology continues to improve, the traditional experience-based construction management problems are more prominent, seriously restrict the improvement of the overall level of construction management. To improve the level of construction management, it is necessary to create a simple, practical and effective construction management mode, innovate a general construction management technology, and at the same time carry out a series of construction management method exploration and mode innovation. Guided by the node method project management theory and based on the whole process of construction management, the new path and method of construction management mode innovation are proposed from the perspective of the construction side, which lays a foundation for the comprehensive realization of model, standardization and information construction management.

Keywords: Node method, Contractor, Construction management, Mode innovation.

1.INTRODUCTION

Construction management is a comprehensive and systematic management work of the construction contractor. Effective construction management is an important condition to realize the minimization of construction project cost and the maximization of income. In the traditional construction management, management is extensive and scattered, there is no clear stage division and node segmentation, it is difficult to form a complete, closed-loop construction management system, often resulting in the construction project cost management out of control. Construction management problems due to the management system is too large and complex, management personnel mobility, experience management instead of standard management, management ideas are not clear, lack of effective theoretical guidance. Moreover, the management system based on experience management is unstable and unsustainable. As soon as the manager changes, the management mode needs to be reconstructed, so that the construction management is in a disorderly and inefficient bad circulation state.

The fundamental reason for many problems existing in traditional construction management is that there is no integrated, systematic and closed loop construction management mode, and its essence is that there is no

practical management theory support. Through the in-depth and comprehensive analysis of the traditional construction management problems, according to the implementation path of node method project management, the goal and ideas of construction management mode innovation are put forward to guide the innovation of construction management mode.

Node method project management is a new method and tool of modern project management [1]. It has the characteristics of simplicity, practicality, efficiency and clear implementation path. It can solve the disjointed stage and decentralized management problems in the traditional construction management from the perspective of system, whole and organization, which is a sharp tool of model management. It can also carry out process reengineering and mode reconstruction for construction management, and build a fixed construction management mode, which does not change due to the different management and different construction projects, and can realize the continuity of construction management mode.

2.NECESSITY OF CONSTRUCTION MANAGEMENT MODE INNOVATION

2.1. The main problems of construction management

Construction management is a comprehensive and systematic construction technology and management work, mainly including project bidding, contract signing, construction preparation, process control, completion acceptance, project final accounts and other stages of work. Is common for a long time, the contractor's construction management planning, top, non-standard, core competition is mainly the construction technology and quality management experience in competition, managers struggling to cope with unplanned work and dealing with various problems due to poor management, difficult to form a complete, system, closed loop mode of construction management, construction management method is difficult to continue. The traditional construction management problems are mainly as follows:

(1)The investigation work in the bidding stage is not in-depth enough, the construction organization design of the bidding documents is a formality, and the bidding price cannot objectively reflect the construction cost and profit level, which often leads to the failure of bidding or the difficulty to achieve the cost control target after winning the bid, bringing difficulties to the construction management work and other problems.

(2)The construction management system is not sound, there is no construction management system or matching organization and evaluation mechanism, the job responsibilities are not clear, easy to cause management vacancy, it is difficult to give play to the initiative and enthusiasm of managers.

(3)The traditional construction management is mainly macro management, lack of detailed content and quantitative indicators, construction management is difficult to implement, unable to form a model, standardization, information construction management mode.

(4)The construction management work lacks effective theoretical guidance, the management is scattered, the work is messy, and it is difficult to realize the systematic closed-loop management of decision-making → implementation → evaluation → management cycle.

(5)Construction management results are more related to the experience and ability of managers. Once the project changes or the manager changes, the management effect will change greatly, and the management experience is not sustainable.

(6)The construction management ignores the coordination and correlation with the owner, the designer

and the supervisor, which is easy to lead to the imbalance of the management work.

(7)Pay too much attention to management results, ignore the importance of construction process control, lack of perfect process management system.

(8)Laissez-faire management results, without quantitative evaluation system and assessment mechanism, management level is difficult to improve.

2.2. Construction management mode innovation objectives

Based on the content and demand of construction management, the innovation of construction management mode is carried out centering on the following objectives.

(1)To establish a construction management mode that can be applied sustainably by different construction parties or different construction projects. All stages of construction management work can be carried out in the mode, and this mode will not change due to the change of managers or the change of construction projects. Under the model, standardized and information-based management and control mode, the management effect will not change greatly due to the difference in the level and experience of managers, but can constantly improve the management level of managers.

(2)The construction management mode should be comprehensive and systematic, with clear stages, clear nodes and closed-loop management, which can be optimized, recycled and sustainably applied repeatedly in different construction projects.

(3)In the construction process control form as construction management tool, based on the form to the whole process of construction management in an all-round way, and the bidding project, the construction organization design, the construction scheme for control in advance, the construction process of supervision and correction, to quantify the management achievements appraisal, continuous upgrading of the overall level of construction management, promote the construction management mode of replication and circulation application.

(4)In the construction management mode, not only the construction party can cooperate with the owner, the designer and the supervisor, so as to give full play to the initiative and enthusiasm of the managers, maximize the management efficiency and reduce the construction cost.

2.3. Innovative ideas of construction management mode

In view of the problems existing in the current construction management work, combined with the innovation goal of construction management mode, its innovative ideas are as follows:

(1) Under the guidance of the node method project management theory, from the perspective of the construction side, from the perspective of the whole process of construction management, the construction management stage is divided, node and management elements are subdivided, and the problem of disconnection and management absence in the construction management stage is solved.

(2)Based on subdivision of nodes and management elements, based on the content of control, based on relevant laws and regulations, with contract management as the focus, with organizational management as the guarantee, with control forms as the tool, to achieve the success of node control and ensure the success of stage control. With the whole process of construction management as the main line, with the overall optimization of construction management as the goal, to achieve the success of stage control to ensure the success of overall control.

(3) Establish the construction management and control form, apply BIM technology to promote the informatization, standardization and systematization of construction management, realize the formalization of construction management, and build the node method construction management platform.

3. THE THEORETICAL BASIS AND MANAGEMENT MODE OF NODE METHOD PROJECT MANAGEMENT

3.1. Theoretical basis of node method project management

Node method project management is based on modern project management knowledge system, management practice, innovation results, concise, practical, effective as the goal, from the perspective of the whole to the part to build a new project management method and new tools. By carrying out project management from the perspective of system, whole and organization, managers can know their position and responsibilities in the whole project. Through the drip accumulation of control results at each node and stage, the success of local management can achieve the success of overall management^[2].

Node method project management from the practical and effective, gradually improve, sustainable management angle to establish a quantitative, continuous, sustainable project management organization concept and knowledge system, provides a system, standard, can improve the project management of new methods and new tools^[2].

3.2. Node method project management mode

Node method project management is guided by

organizational management, based on objective management, process management and results management, focusing on the control of key nodes in each stage of the project, and carrying out targeted organizational control such as rule organization, process organization, target organization, responsibility organization and coordination organization of the whole, stage and node. The closed-loop management of project establishment → decision-making organization → goal formation → implementation organization → achievement formation → evaluation organization → project replication is realized, and a management system of "book with text" model organization, "train with track" standardized management and control, and "weights and measures" information measurement is formed^[2].

Based on node method, project management can be divided into decision-making, implementation and evaluation of three phases, depending on the project or manager is different, each stage can be subdivided into different several nodes interconnected up and down, and with the success of the node control insure the success of the stage of management to the success of the phase control to ensure the success of the whole project management^[2].

The whole process project management model of node method is shown in Figure 1.

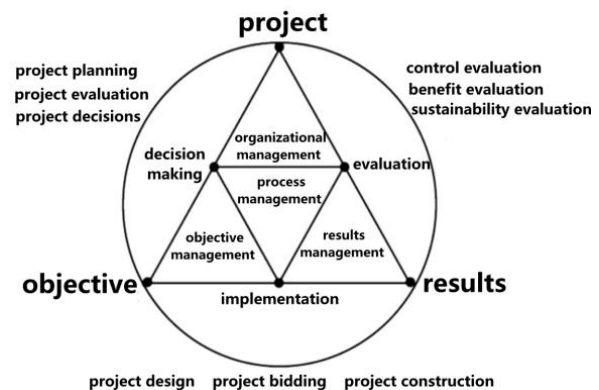


Figure 1 Node method project management model

4. CONSTRUCTION MANAGEMENT PATH BASED ON NODE METHOD PROJECT MANAGEMENT

Based on the nodal method project management theory, combined with the construction management practice and results, with the goal of simplicity, practicality and effectiveness, the construction management process is reengineered and the control system reconstructed from the perspective of the whole to the part, and the construction management mode is innovated through the following steps^[3].

4.1. Establish the idea of construction management

The innovation of construction management mode is guided by node method project management [3], and its management theory is the theory of construction management mode innovation.

(1)Construction management concept. Organizations determine rules, goals guide actions, processes control results, and results enhance management.

(2)Construction management objectives. The overall optimization of construction management is the goal.

(3)Construction management essence. In the construction management mode, concept, exchange, communication to achieve "book with text"; In the construction management method, technology, tools, achievements to achieve "train with track"; In the construction management assessment, evaluation, summary, accumulation to achieve "weights and measures".

(4)Construction management mode. Model organization, standardized management and control, information evaluation.

4.2. Design construction management model

According to the whole process project management model of node method, the node method construction management model is designed[4], and the process is as follows:

(1)Control system. Construction management must have a complete management process, that is, project establishment → decision-making organization → goal formation → implementation organization → achievement formation → evaluation organization → management copy, this is a complete, closed loop, circular construction management system, should have the pattern, sustainability and universality.

(2)Major phase. Construction management can be divided into three stages: decision-making, implementation and evaluation.

(3)Key link. Construction management can be divided into three parts: project, objective and results.

(4)Control elements. According to the construction management process, the management elements are divided into organization management, objective management, process management and results management.

(5)Key nodes. The decision-making stage can be divided into three nodes: proposal preparation, preparation of the tender and contract signing; the implementation stage can be divided into three nodes: construction preparation, construction process and completion acceptance; and the evaluation stage can be divided into three nodes: control evaluation, benefit evaluation and sustainability evaluation.

The node method construction management model is shown in Figure 2.



Figure 2 Node method construction management model

4.3. Design construction management organization process

Node construction management process is the expansion of the construction management model and extension, node based on this result delivery and receiving work mode, ensure construction management is to organize the implementation, in the same way that management achievements of each stage, each node can be done in a system "books with the word" communication, "train with track" quantitative correction, Assessment and evaluation of "weights and measures" [3].

The organizational flow of node method construction management is shown in Table 1.

Table 1. Node method construction management organization process

The main stage	The key nodes	Organizational management	Objective management	Process management	Results management
Decision making	Proposal preparation	The management system	Quality objectives	Objective to determine	Results of the node
	Preparation of the tender				
	Sign the contract				
Implementation	Construction preparation	The organization	Progress of the target	Results management	Stage results
	The construction process				
			The cost target		The overall results

	Completion inspection and acceptance	Responsibility			
Evaluation	Control evaluation				
	Benefit evaluation				
	Sustainability evaluation				

4.4. Subdivide construction management nodes

On the basis of the node method construction management model and organizational process, the construction management nodes are subdivided according to different construction projects or different construction parties. Node subdivision is based on each stage of construction management to ensure that the target is clear, the control is in place, the results are quantified and deliverable, and the results of the previous

node are used as the foundation of the next node. At the same time, node subdivision should have clear and scientific management and control objectives, planning "how fine we want to manage" from the perspective of sensibility, evaluating "how fine we can manage" from the perspective of resources, and determining "how fine we should manage" from the perspective of science [2].

The breakdown of construction management nodes is shown in Table 2.

Table 2. Construction management node segmentation

The main stage	Objective management	Process management	Results management
Decision making	Bid planning	Cost accounting	Construction quota
	Construction quota	Market research	Cost information
	Cost information	Construction organization design	Bid quotation
	Bid quotation	Scaling	The price tag
	The price tag	Sign the contract	Contract price
Implementation	Contract price	The subcontract management	The cost price
	The cost price	Professional subcontractor	The subcontract price
		Material purchasing	The purchasing price
		Construction preparation	Management cost
	Management cost	Technical management	Technology costs
		The safety management	Safety cost
	Communication cost	To organize and coordinate	Communication cost
Completion inspection and acceptance		Settlement price	
Evaluation	Construction control	Control evaluation	Control results
	Contract effectiveness	Benefit evaluation	Performance results
	Integrated management	Sustainability evaluation	The overall results

4.5. Design construction control form

Node method construction management control form is the technical tool of node method construction management, but also the foundation of construction management information. The construction management and control form is used to carry out the systematic and overall construction management organization from top to bottom. Meanwhile, the form is used to record the whole process of construction management and control results, so as to provide quantitative and continuous feedback of construction management results from bottom to top. Forms are used to organically organize

management flow from top to bottom and information flow from bottom to top to show the control process and express standardized and informationized management results.

The design of node method construction control form aims at improving management quality and effect. The specific content and form of the form can be different according to different construction projects and construction parties. Sub-forms can also be designed under the form [3].

See Table 3 for the classification of node method construction control forms.

Table 3. Node method construction control form classification

Management factors	Organizational management	Objective management	Process management	Results management
Classification of construction	Construction management system and system table	Construction quality schedule	Construction contract control table	Quality management achievement sheet

control forms	Chart of construction management organization structure	Construction schedule	Construction technology control sheet	Progress management achievement sheet
	Schedule of responsibilities of construction management positions	Construction cost schedule	Construction organization control table	Cost management achievement sheet
	Diagram of construction management process	Safety management schedule	Construction data control table	Management achievement analysis table

4.6. Construction management information construction

Based on the construction control form information and BIM technology as a means, a digital and

informationized construction management platform is created to build a new model of construction management that is patterned, standardized and informationized [5].

See Table 4 for the functional framework of the node method construction management platform.

Table 4. Functional framework of node construction management platform

Organizational structure	System function
Organization and management	Management process, management organization, management system, laws and regulations, management authority
Integrated management	Subcontracting management, cost management, quality management, schedule management, safety management
The subcontract management	Management system, subcontracting plan, process control, management results, subcontracting materials
Cost management	Management system, cost planning, process control, management results, cost data
Quality management	Management system, quality plan, process control, management results, quality data
Schedule management	Management system, schedule, process control, management results, schedule data
The safety management	Management system, safety objectives, process control, management results, safety data
Contract management	Management system, construction contract, subcontract, cost contract, contract data

5.CONCLUSION

Based on the application research of the above node method project management in construction management mode innovation, the following conclusions are formed:

(1)It is necessary and feasible to guide the construction party's construction management mode innovation with the node method project management theory, and the implementation path is scientific and clear.

(2)As a tool of the whole process of construction management, the construction management level and technical level can be effectively improved by the model, standardization and information node method construction management mode.

(3)With the node method construction party construction management mode, can promote the construction management work more detailed and quantified, is to realize the construction management information, digital and intelligent basis.

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