S17-5

SELECTING OPTIMUM MANAGEMENT PRACTICES IN PRE-CONSTRUCTION PHASE CONSIDERING PROJECT CHARACTERISTICS

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ABSTRACT: The importance of project performance management as an alternative for solving problems is rising, which are followed by the difficulties of managing construction project in the construction industry. This research classifies and applies the potential improvement made by the construction practitioners. In order to apply influential factors for success on the construction project, the research identifies the relationship between the factors and performance management practices. In addition, in order to predict the results reflecting the project characteristics which are un-improvable by the construction managers in the initial stage of construction, the effect of project characteristics to the identified management practices have been drawn by performance area. Finally, in order to improve the predicted performance, this research provides a framework in setting valid best practices according to the performance areas through a statistical analysis between the best practices and project characteristics through the industry survey.

Keywords: Project Performance Management, Performance Improvement, Pre-Construction Phase, Construction Management Practice, Project characteristics,, Performance Difficulty Level

1. INTRODUCTION

With an increase in difficulty of construction project management in the construction industry, the importance of project performance management is being emphasized as an alternative that can solve this problem. Construction companies need to eliminate inefficient aspects of construction projects, understand their current standard and benchmark model projects to establish a rational project management strategy and conduct performance management that can improve project results (Cha et. al. 2008, Yu et al. 2004, Shin et. al. 2005).

The U.S. CII (Construction Industry Institute) has made comparison of performance evaluation of projects and benchmarked individual projects throughout best practices for improvement of results by a project practitioners. In addition, many existing studies on the project success that have an effect on project performance use multidimensional factors and methodologies to present best practices as benchmarking information to improve project performance.

However, although many existing studies have been conducted on the elements that have an effect on the success of a project, their results are failing to receive wide approval from the construction industry. This is because the elements of success are mixed with few independent variables and project-specific variables in relation with project characteristics. In addition, there is few specific tools in matching the best management practice (Chan et al, 2004). Thus, the elements that have an effect on the success of a project are not divided into whether they can be improved according to the efforts of the construction practitioners and are mixed up, making it difficult to effectively apply the elements for after-project management. Also, despite the fact that the difficulty of performance extraction is different according to the different project characteristics, there is no reflection of this aspect.

As a result, construction managers have a tendency to depend on experience when establishing performance management strategies appropriate to the characteristics of each project, and there is the problem of inefficiency when attempting to make strategic decisions on selection and degree of execution for effective benchmarking of best practices to a particular project. This is why domestic project performance management is currently unable to fulfill the function of performance improvement, and is remaining just as an idea of performance evaluation.

Therefore, this study has attempted to make establishment of an effective performance management strategy that reflects the characteristics of a project in the early stage of construction. The effects of project characteristics on results have been predicted, and a method of selecting specialized optimal best practices that can improve the predicted performance has been suggested.

The aim of this study is to predict the effects of the characteristics of a project on performance and present a method to select most optimal best practices that can improve predicted results, to make establishment of an effective performance management strategy that reflect project characteristics in the earlier stage. The process of this study is divided into 1) analysis of previous studies and identification of problems, 2) extraction of elements

for project performance management, 3) design of a project performance area, 4) extraction of a construction practice that affects project performance, 5) presenting an algorithm to select the optimal construction practice.

2. ELEMENTS OF PERFORMANCE MANAGEMENT

2.1 Project performance area

The results of the preceding study, "Development of a Field-focused Risk Management Optimization Program through Development of a Construction Project Performance Prediction System" (Cha et. al., 2007) and the results of other domestic and foreign studies were used to define the range of performance as summarized in Table 1, below.

Table 1. Project performance area

Performance Area	Definition and method of measurement
Contract management performance	Measured with the cost and time following a conflict. Performance related to project success following effective contract management.
Cost management performance	Measured with the increase rate of the budget in the early stage and the accuracy of predicted cost. Performance related to effectively completing a project within a set budget.
Air performance	Measured with the increase rate of the air planned in the early stage and the accuracy of predicted air. Performance related to effectively completing the project within the set amount of air.
Quality performance	Measured with the rate of materials passing the quality test and cost and frequency of redone work. Performance related to effectively materializing the quality required by the client.
Risk management performance	Measured with the rate of reserves used and the increase of cost due to a change in design. Performance is related to effective management of various risks that can arise during a project.
Safety and environment performance	Measured with the rate of accidents in the field, the rate of waste that is created, and the number of civil complaints. It is comprehensive performance related to existing safety performance and environmental performance.
Productivity	Measured as productivity per employee and laborer.

The 7 areas as defined in Table 1 were used to measure each type of project performance and apply it to the study.

2.2 Project characteristic factors and construction management practices

This study divided the elements of project success to project characteristics and construction practice according to whether or not improvements are achievable through the efforts of the construction managers.

Table 2. Construction management practices

Construction management practices	Definition
Establish goal	Setting and sharing of performance goals
Establish cooperative relationships	Degree of cooperation between participants for successful project operation. (attitudes towards each other)
Create team	Project operation structure
Benchmarking	Feedback on similar performance (analysis and level of application)
Value engineering	Value engineering, review of constructability and other degrees of operation (VE operation standard)
Construction plan	Planning for start-up, temporary plan, division of work, solution to delay of construction (write up construction plan)
Risk management	Awareness, evaluation, establishment and degree of execution of alternative process
Award system	Incentive, penalty [Clearness of award evaluation standard (specific standard)]
Change control	Convenience of document management, plan updates
Quality control	Education, materials auditing, checking for defects
Cost, process management	Comparative analysis of execution in comparison to plan (measurement, analysis, update)
Materials management	Execution of materials management
Cooperating companies management	Whether there is feedback on evaluation of subcontractors (whether there is a tool of evaluation and the results are later reflected to construction)
Information system	Whether construction is managed through informatization and electronification like PMIS
Application of cutting-edge technology	How much cutting-edge technology such as RFID, 3DCAD, ROBOT, GPS (Global Positioning System), PDA, USN (Ubiquitous Sensor Network) are applied to the field and used

Preliminary research was conducted on the elements of project success and whether or not they should be improved were considered to divide them according to project characteristics and construction practice areas, and define each factor. The pools with similar significance level were re-organized, and categories with an upper and lower relationship were given levels and grouped to create preliminary candidate factors. These factors were

verified to see whether it was appropriate for the domestic project field through advices from the construction experts, and elements that were defined as the characteristics of their current project and construction practices used were additionally extracted and applied. The finalized set through this process are shown in Tables 2 and 3. These set of factors and definitions were used for the study as elements of performance management.

Table 3. Project characteristic factors

Field of characteristics	Characteristic factors	Specific fields and definition
General characteristics	Project type	Divided into residences, commercial, industrial, education, culture and combined facilities.
	Project scale	Characteristics defined by standards such as contract amount, above land and below land scale, surface area.
	Bidding method	Project contract method defined by divided design and construction orders, turn-key, CM order, etc.
	Method of deciding contract amount	Amount deciding method defined by total amount contract, contract based on quote, actual cost calculation contract, etc.
	Land conditions	Condition of surrounding land such as inner city constructions, new city development, etc.
	Ground conditions	Condition of ground decided by complexity of foundation and difficulty level of construction.
Characteristics of participants	Characteristics of client structure	Whether the client is a public facility or private facility.
	Scale of client structure	Characteristics according to scale of client structure.
	Experience of client conducting similar projects	Index of whether the client has experience conducting similar projects -- defined as none, 1-2 times, 3 times or more.
	Clearness of requirements of client	How specifically the requirements of the client are defined in the specs sheet and plan.
	Cooperating attitude of designer	How much aid the designer offers in the early stage of construction, including constructability review and VE.
	Scale of designing company structure	Number of employees of designing company -- defined as over 500, 50-500 and under 50 people.
	Experience of the designer conducting similar projects	Index on experience of designer conducting similar projects.
	Number of similar projects conducted by builder, performance	Average performance according to whether the builder has experience conducting similar projects.
System and environment characteristics	Conditions of system	Level of difficulty of applied system when conducting project.
	Financial conditions	Stability of financial market while conducting project -- defined as increase rate of raw materials cost, etc.
	Social conditions	Ease of supply and demand of labor workers when conducting project.

3. SELECTION OF A CONSTRUCTION PRACTICE THAT REFLECTS PROJECT CHARACTERISTICS

3.1 System for selection of a construction practice that reflects project characteristics

The ultimate goal of this study is to improve performance through performance management. In order to reach this goal, this study aims to propose the optimal construction practice that reflects project characteristics in the early stage of construction, and improve performance. As examined above, for effective performance management, performance needs to be measured objectively for comparative analysis of the project results with the

standard performance of the construction industry, and performance needs to be managed to make improvements possible through benchmarking. In addition, project characteristics that affect project performance and cannot be improved should be reflected, and multidimensional performance management through which construction practices that can be improved and benchmarked is needed. Therefore, this study proposed the optimal construction practice selection system that reflects project characteristics for construction project performance management, as shown in Figure 1.

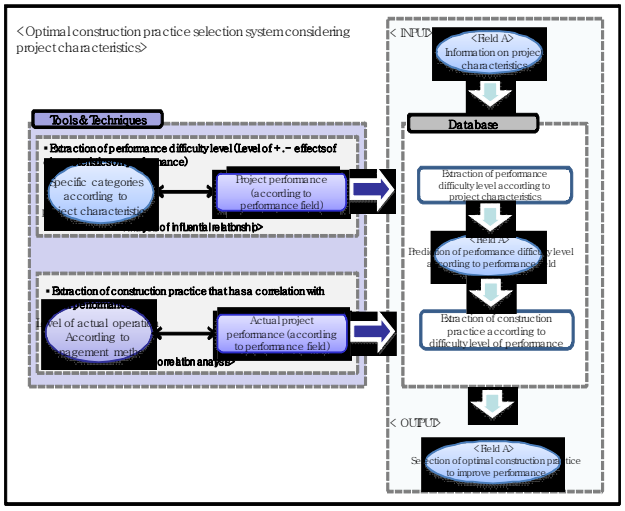

Figure 1. Concept of optimal construction management practice selection

First of all, the relationships between the characteristics of the construction project, construction practices, and project performance were set. The relationship of influence between the project characteristics and performance was clarified first, and then the effects of project characteristics in the early stage on performance were predicted as quantitative performance difficulty level. In addition, the quantitative correlation between construction practice and project performance were clarified and a construction practice that can be benchmarked was presented. Then, when this led to actual information on project characteristics, this would lead to presentation of an optimal construction practice according to prediction of performance difficulty level.

3.2 Management method selection algorithm that reflects project characteristics

Based on the theories presented above, the process shown in Figure 2 was created and applied to select the optimal construction practice. The optimal construction practice is selected by the group of rules that select the best construction practices based on the entered data. The relationship of influence on performance of project characteristics was calculated as performance difficulty level according to the system and ideas presented in 3.1, and the correlation according to performance was analyzed. Based on the analysis results, when information on the project characteristics was provided performance difficulty level is predicted, and construction practices that can be benchmarked for areas that have difficulty with performance are presented.

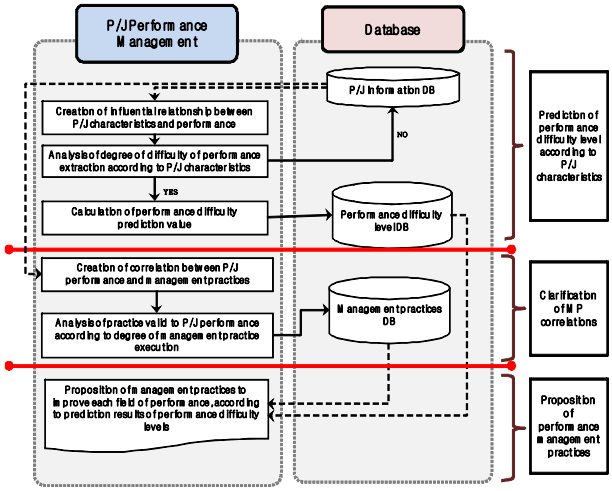

Figure 2. Optimal construction management practice selection algorithm

4. CONCLUSIONS

This study divided project success factors according to whether there could be improved through the management efforts of the construction managers, and applied them as project performance improvement factors by matching the most appropriate performance areas. An algorithm for selecting the best performance management practices was presented. The proposed algorithm assists project practitioners to improve the target project in terms of leveraged performance areas in the early phase. In addition, this research can be used as a foundation for presenting the optimal construction management practice to improve project performance level. Although this study proposes a conceptual algorithm, the data collection would effectively quantify the degree of difficulty in construction project performance. As a quantitative system, the results provide an analytical approach in matching the best management practices based on the relationship between performance and elements of success. It is hoped the results of this study will be strategically used for selection of optimal construction practices needed for project managers to improve their desired project performance.

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