

# A Benchmarking Tool to Assess the Role of the Construction Manager in terms of Project Teamwork Supports

Kim, Chan-Kyu\*

*Department of Architectural Engineering, Sunmoon University, TangJung-Myun, Asan city, 336-708, Korea*

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## Abstract

Construction management services have been adopted for more than a decade and are continuously growing; however, the advantages of utilizing a construction management service are still not quite clear, regardless of many arguments can be made in their favor. The construction manager, as a coordinator, is supposed to smoothly facilitate the project teamwork in order to deliver a profitable and satisfactory project, not only for the owner's interests but also for the success of all project participants. This study has focused on the teamwork supports a construction manager can provide during project operations. This study developed a benchmarking tool to assess the construction manager's role in terms of its project teamwork supports, by utilizing the evaluation model and several case studies. In addition, this study also attempted to set the industry average and higher performance so that both the owner and the construction manager can self-assess, and more importantly, can improve project operation. The actual implementation of the benchmarking tool into on-going projects can allow the construction manager to understand the current operation and to make a better project process through teamwork.

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Keywords : Benchmarking, Teamwork, Construction Manager

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## 1. Introduction

Construction management service was introduced by Framework Act on the Construction Industry in 1996. After on, construction management has been gradually growing. The sale amount of construction management service before 2001 was merely about 40 million dollars, and the sale of year between 2001 and 2002 was around 90 million dollars. However the entire sale of construction management service between year 2007 and 2008 was over 9 billion dollars[1]. It represents construction management service has grown more than fifteen times as much as it was ten years ago. Not only the sale amount of construction management

service but also the role of it has been refurbished. The first construction management service applied to World Cup Stadium in 1999 was not much different from the one of traditional superintendence job, which was regulated by law. However, construction management service has been evolving from that time on. It has gradually consumed such tasks as design review, value engineering, permits, feasibility studies, financial aids, sale promotion and so on[2]. This could provide the great opportunities for both owner and construction manager to create a profitable or satisfactory project outcome. Even constructor could see construction manager not as an obstructor but as a helper. However, the advantages of utilizing construction management service are not quite clear so far regardless of many arguments. Some say cost-effective and some say time-efficient. Research finding these advantages of construction management use has not been conducted yet leaves much to be required.

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\* Corresponding author: Kim, Chan-Kyu

[Tel: 82-41-530-2378, E-mail: qkim@sunmoon.ac.kr]

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In Korean construction industry, there are apparent limitations of construction manager to exercise its role. Construction manager in accordance to the contract has no rights to control scope, budget, and schedule. And it is not even allowed to decide the upper limits and lower limits of project quality. Consequently it is not probable or fair to assess construction manager by project cost or time. Many projects have frequently resulted in over budget and schedule regardless of construction management use. But sometimes when a project goes wrong, construction manager is but to blame. Then what are the advantages of exploiting construction management service? What is the use of construction manager? Construction manager is the only one in the project that has no conflict while the other participants have their own. Therefore, It is evident that construction manager, as a coordinator, has to make project participants work together. Construction manager is supposed to lubricate or facilitate project teamwork so as to deliver a desirable outcome for the owner's interests and to meet the other project participants' goal. To make project team together lots of ability and experience are required. This study has focused on the teamwork support of construction manager because it is believed to be a key role of construction manager.

## 2. Objective and Methodology

This study is to develop a benchmarking tool to assess construction manager in terms of project teamwork supports. And it also attempts to set the current industry average and superior performance to self-assess and more importantly improve the project operations. By doing so, the owner will trust construction manager better and construction manager is able to lead the entire project team

and hopefully produce a win-win situation among the project participants. This study includes the three activities; to develop an evaluation model to assess the teamwork supports of construction manager, to run several case studies in order to adapt and adjust the developed model, and to implement the benchmarking tool into on-going project for improving project operations.

## 3. Development of Evaluation Model

Teamwork is defined in many ways. It is a work performed by a team toward a common goal[Webster Dictionary]. The interdisciplinary sharing of knowledge, information and goals among the participants(i.e., according to Pietroforte[3]). Seamless Process[4]. The integrated efforts for the project success(i.e., according to Levitt[7]. The innovative alignment for integration [8] and so on. To induce attributes of teamwork the following model is introduced. Figure 1 shows the teamwork process in sequence. This model illustrates the procedure of how teamwork is accomplished. The procedure is presented in order from (a) to (f). Each rectangular shown represents the aggregation of all tasks required to execute the project jobs. The first (a) is in the state full of job remaining in the beginning. Then in stage (b), party A comes in the project and takes some portion of tasks, but still many tasks are remaining unassigned. At this stage the first attribute of teamwork is derived, which is competence. A specialist with expertise and experience has to arrive to take certain tasks. In stage (c), other two parties come in the project to take the rest of jobs remaining. So there are no more dark areas. The second attribute can be derived as agreement of the specialists to abide by the rules to complete their tasks by contractual agreement. Otherwise the project could be ambiguous state which

task is whose. However, as it is shown in the figure, duplications and redundancies of tasks still exist. In stage (d), arrangement is made among the participants. There are no more duplicative tasks. To reach this stage derive the third attribute is introduced as coordination which is an alignment to organize the process and to define scope preventing the specialist from being confused.

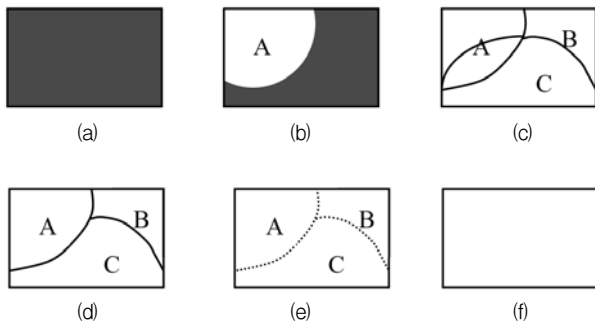


Figure 1. Teamwork Process Model

The state (d) is not still representing a state of good teamwork because of seams between parts. These seams are interpreted as barriers which obstruct the understandings of each other. What can resolve these barriers? It is the exchange of information. Communication defined as “to give or exchange information” is introduced as the fourth attribute. The complete and correct information flowing through project participants makes it possible to transfer the work load efficiently. Through communication the stage (e) is reached, however, the act of exchange information cannot solely remove the barriers. As you can see, there are still remaining barriers even though they are not as vivid as they were in stage (d). The reason is assumed that because each party has its own interests and is characterized as its own goals. But the desirable teamwork operation has to be accomplished to arrive at the stage (f) of which definition is integration. The results of CII task force are utilized in this stage. It reported that

partnering alliance requires trust and sharing common goal[CII, 1996]. Therefore, trust and congruence are derived as the fifth and sixth attributes. The composition of teamwork attributes consists of three aspects as shown Figure 2, people, management, and technique. Congruence and trust are related to people, agreement and coordination and are related managerial aspects, and competence and communication are related to technical aspects of the project. Table 1 represents the identified attributes of project teamwork. This study tried to define each attributes specifically with according sub-attributes. Definitions represented here is concentrated on the teamwork supports of construction manager, however this model can be used for any other project participants or the whole team. Based on this developed evaluation model, case studies has been conducted to verify the model acceptable and to adjust the model into a practical forms.

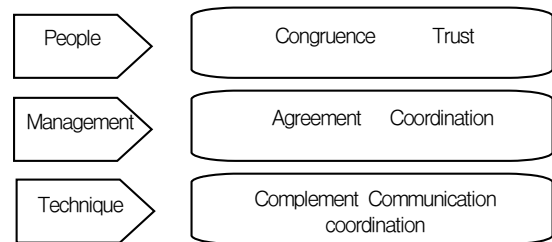


Figure 2. The Composition of Teamwork Attributes

#### 4. Case studies

Case studies were conducted in order to achieve the following objectives. First, the developed evaluation model should be validated and adjusted for the actual implementation. Second, among the attributes, there should be a certain ranking system, because all the attributes are not supposed to be measured equally. Some attributes are more important than the others. Therefore a statistical

**Table 1. The Attributes of Project Teamwork**

Attributes	Sub-Attributes	descriptions
Competence (A1)	Characteristic	The nature or talent to fully execute certain tasks
	Expertise	Professions directly related toward the specialized work
	Experience	The achievement of previous practice and participations
	Technical ability	Sufficiency in understanding for the required works
Agreement (A2)	Scope of work	Conformity to specifications and appropriate compliance with change and modification
	Project schedule	Awareness and conformity to project schedule and proper execution for delay and revision
	Construction method	Consistent operation or procedure to pre-determined methods
	Procurement	Agreement in selecting subcontractors, vendors, Suppliers and equipment
	Quality assurance	Awareness and conformity to the project quality assurance
Coordination (A3)	Organization structure	The appropriate arrangement of functional relationship
	Construction management manual	The existence of construction management manual or procedure to execute project management
	Administration	The management and settlement of official execution
	Approving procedure	The effective arrangement of approving and receiving procedures of drawings, documents, and payments
	Reporting System	The judicious and adequate use of reporting system
Communication (A4)	Change procedure	Utilization of procedure for necessary change and modification
	Clearness	Clarity in exchange information and sharing data
	Completeness	Completeness of information among the participants
	Correctness	Correctness of distributes information
Congruence (A5)	Punctuality	Availability of information on time
	Project objectives	Awareness and conformity to the project objectives and goals
	Involvement	Participation in resolving issues and problem solving
	Eagerness	An attitude with voluntary cooperation
Trust (A6)	Devotion	Concentrated efforts regarding resolving issues and problems
	Openness	Freely communicating ideas and expressing them without fear of repercussion
	Flexibility	Flexibility in dealing with particular job circumstances
	Fairness	Fair and just treatment of other party in all areas of the project

analysis to decide weight factor has to be made.

Third, implementation of the developed model into the recently accomplished projects, where construction management service was adopted, should be provided in order to assess the teamwork support of construction manager. And fourth, from the observe data of case studies the attempted industry average and superior performance has to be made so that the evaluation model can be utilized as a benchmarking tool. And finally with this tool, one more case study for the

on-going project should be conducted to see how this model could help owner or construction manager improve the project operations. Table 2 shows the projects involved in case studies. All these projects acquired construction management service and were accomplished recently. Case study was conducted via interviews, questionnaire, phone, email, and exchanging of evaluation model. Spreading massive questionnaire is not appropriate to this kind of study, therefore case studies were conducted on a personal contact basis. Total 46

**Table 2. The projects of Case Studies**

Project Name	Location	Budget(\$)	Duration	Owner
Sun Maeul	HongChun, Kang-Won	22 million	2005.4~2007. 11	Daewoong Inc.
Kwang-Joo City Hall	Kwang-Jooo , Chun-Nam	48 million	2007.2~2009.4	Kwang-Joo City
Osung Bio Center	Osung, Chung-Nam	430 million	2007.5~2010. 10	The Health and Welfare Administration
Inchon University Relocation	Song-Do, Inchon	237 million	2008.2~2010.10	Inchon City
Dream Forrest	Sung-Buk, Seoul	41 million	2006.6~2008.9	Seoul City
Nurikun Square	Sang-Am, Seoul	196 million	2007.11~2010.10	Sang-Am Electronic
Hiwon Condominium	Jung-Sun, Kang-Won	200 million	2007.4~2010.8	Kang-Won Land
Tower Hotel Remodel	Jang-Chung, Seoul	60 million	2007.5~2010.3	Urban Oasis

members of those projects, who were in charge of actual operations, including owner, construction manager, constructor, and designer, were in contact to validate the model and to decide weight factors. But the actual assessment of construction manager was made solely by the owners because of consistency and fairness. And the author had really hard time getting in contact with the owners of the projects where the case studies were involved.

Around 76% of the response agreed on the developed evaluation model as acceptable to use assess the teamwork supports of construction manager. However, a subjectivity issue of this model was occurred among the responders. So It is required that a certain measurement method or tool exist. Quantification of measurement would be good for evaluation, but the most are not quite possible. Thus the model was divided into two ways, which are a subjective measurement and a quantifiable measurement. Even it is a subjective measurement, the status or environment of the score given was stated. Table 3 is an example of measurement for project objective attribute. The state of construction manager's efforts was described according to the score given. By using this statement, responders are able to give the score in conformity without prejudice or confusion.

**Table 3. The Subjective Measurement of Project Objective Attributes**

Project Objective	
Construction Manager is to ; Fully understand the project goals and exert leadership to avoid conflict interests and to attain common goals among the participants	9~10
Meet owner's objectives and persuade the other participants into aligning common goals	6~8
Struggle in coping with owner's objectives and fails to make participants understand the project objectives	3~5
Be not quite aware of owner's objectives and makes little efforts to communicate with other project participants	0~2

The example of quantifiable measurement is illustrated in Figure 3 showing approving procedure sub-matrix. Approving procedure, sub-attribute of coordination can be measured by several observations such as wrongdoings of construction manager. Actually to obtain accurate measurement, it surely requires lots of case studies, but this is providing a general idea of quantitative measurement and is sufficient for responders to grasp the measuring method. The score given in this sub-matrix will be used and added in the higher attribute matrix so that the overall scoring can be presented. Performance index shows the percentage value of the score acquired against the maximum score.

Construction manager missed or neglected the percentages(%) of the following procedures:							Score
Design Review	Design Revision	Work Order	Material Usage	Review Submittals	Quality Inspection	Review Payments	
5	5	2	5	5	2	2	10
10	10	5	10	10	5	5	9
15	15	10	15	15	10	10	8
20	20	15	20	20	15	15	7
25	25	20	25	25	20	20	6
30	30	25	30	30	25	25	5
40	40	30	40	40	30	30	4
Adequate procedures do not exist							3
8	7	8	6	7	9	9	
Performance Index						67	

Figure 3. Approval Procedures sub Matrix

The next step of case studies was to find weight factors among the attributes of project teamwork because each attribute are not supposed to count equally. The major participants involved in the projects shown Table 2 helped to estimate weight factors with the response of questionnaire. It was a ranking system which each responder decide the most important attributes in hierarchical order.

Table 4 represents the results showing the designated weight factors for each attributes corresponding to mean value acquired by the responses. The score of weight factors were arranged in order to make the maximum score of 1,000 point in the evaluation system. It was found out interestingly that competence of construction manager was represented as an important attribute of project teamwork supports. Agreement and congruence also were positioned highest in rankings.

Table 4. Mean Value and Weight Factors of Attributes

Attributes	Mean Value	Weight Factor
Agreement	14.2	2.00
Competence	10.5	1.75
Congruence	8.6	1.64
Coordination	7.2	1.58
Trust	5.3	1.53
Communication	5.2	1.50

## 5. The Results and Implementation

Using adjusted evaluation model and arranging weight factors, the actual assessment was conducted. The eight projects, which were recently accomplished by both public and private sector, were used to evaluate the teamwork contribution of construction manager by the owners. Table 5

Table 5. The Evaluation of Construction Manager's Project Teamwork Supports by Case studies

Projects	Attributes	A1	A2	A3	A4	A5	A6	Total	Ranks
		146	142	129	137	<b>126</b>	<b>119</b>	799	2
Sun Maeul at Hong Chun, Kang-Won		134	146	118	119	96	101	714	7
City Hall at Kwang- Joo, Chun-Nam		<b>159</b>	<b>162</b>	<b>143</b>	<b>144</b>	112	114	<b>834</b>	<b>1</b>
Bio Center at Osung, Chung-Nam		127	126	120	108	92	106	679	8
Inchon Univ. Relocation, Song- Do		148	138	132	124	105	112	759	4
Dream Forrest, Sung- Buk, Seoul		132	151	133	121	115	123	775	3
Nurikun square, Sang- Am, Seoul		136	146	128	128	104	106	748	5
Hiwon Condominium, Chung -Sun		133	134	128	106	101	<b>119</b>	721	7
Tower Hotel Remodeling, Seoul									
	Average	139	143	128	123	106	113	753	
	Percentage(%)	79	71	81	82	64	73	75	

illustrates the results of case studies. The columns of the table presented the attributes shown in order of Table 1. And numbers given are the scores according to the evaluation model. The darker numbers are the highest score of each attribute and the shaded area represented a superior performance among the projects. Bio Center built in Osung was the best practice of construction manager's teamwork efforts in the observed case study. The bottom row indicates the percentage value given for each attribute in order to understand the magnitude of the score. 753 points shown at right bottom corner is the average value of evaluation. Coordination(A3) and Communication(A4) acquired relatively higher points than the rest of attributes. Congruence(A5), goal alignment efforts and devotion for project operation, was found to be the most complaint from the owners. The case study of this research contains 8 projects, so it may not be possible to present the industry average and a superior performance. However, judging from that the annual sale amount of construction management service is around 300~400 million dollars only per year, and also as long as the projects observed is current, the data collected here cannot be negligible rather considerable. The actual implementation was conducted having used the results of case studies. The project, to which the developed benchmarking tool was applied, was the expansion job of Seoul Nation University General Hospital in Bun Dang. The project is still in progress, so the benchmarking tool was utilized for both its usability and probability of improving project operations.

The evaluation was accomplished by both owner and construction manager which was thought to be interesting. Table 6 shows the results briefly. Owner's assessment was 768 points total. This is a little higher than the average of case studies

saying construction manager is doing fine. And Congruence(A5) is much higher than the average and close to a superior performance. That explains that owner is somewhat satisfactory of construction manager's efforts and devotions. However coordination(A3) is lower than the average, which still gives room for improvements. Construction manager is required to check the stated procedures and be on duty of sequential activities.

**Table 6. The Assessment of Hospital Expansion**

	A1	A2	A3	A4	A5	A6
OWr	136	152	114	123	123	120
CMr	150	154	121	119	136	128

## 6. Conclusion

The advantages of construction management service are not clearly known. Construction management service in Korean construction industry is not contractually allowed to control cost and schedule of the project. Therefore this study attempted to investigate the teamwork supports of the project construction manager can provide because he is able to exert leadership in project team integration, since knowing that he is in the only one without any conflict interests. This study developed a benchmarking tool through conducting case studies. The developed benchmarking tool can be utilized for the on-going assessments of a construction manager's teamwork supports and for the improvement of the project operations.

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