An Assessment of Contract Management Capabilities for Overseas Construction Projects

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Abstract

While contract management is an important factor determining the profitability of overseas construction projects, it poses considerable difficulties for Korean construction companies. This study aims to assess the contract management capabilities of Korean construction companies, and to derive some key items worthy of close consideration as an important measure for strengthening their competitiveness. First, we defined the contract management process based on an analysis of the literature. Then we derived the capabilities required for each process stage, and carried out questionnaire surveys with 92 overseas project experts. The questionnaire was divided into two parts. The first questionnaire analysis was performed to identify major contract management capabilities that were intuitively perceived as being important by the experts. This was done using the AHP technique. The second questionnaire analysis was performed to identify capability deficits by assessing current performance level and the perceived importance of contract management capabilities. The results were subject to the Borich Needs Assessment Model and the Locus for Focus Model. The results of this study can be used for devising strategies to improve contract management capabilities and thus contribute to enhancing the international competitiveness of Korean construction companies. While the study was principally concerned with major companies looking for international contracts in the building sector, the analysis process and method can be utilized for the self-assessment of individual companies of varying sizes or specialties.

Keywords: *contract management, capabilities, AHP, borich needs assessment model, locus for focus model, korean construction companies*

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1. Introduction

The international construction market is expected to sustain its rapid growth rate of over 7% per annum until 2018. In line with this trend, the international market penetration of Korean construction companies is on the increase (Kang and Lee, 2015). And yet, their profit margins of overseas projects have been increasingly eroding. Even some of the biggest Korean construction companies have slipped into deficit in the international market. While inadequate project management capabilities have played an important role in this worrying trend, above all, contract management is perceived as the most important factor challenging Korean construction companies entering a foreign market (ICAK, 2010). The 2012 report of the Construction Economy Research Institute of Korea (CERIK) revealed that the average claim costs borne by Korean construction companies in overseas projects account for 2–5% of the contract amounts (ICAK, 2010). Given that the average profit margin of overseas projects account for 3–7% of contract costs, adequate contract management is an important determinant of the profit margins of overseas projects.

To be able to respond to overseas' claims, contract management should be implemented in a systematic and unambiguous manner from beginning to end (of each project). In this regard, Kim *et al.* (2013) presented "inadequate preparation of bid submission," "inaccurate interpretation of contract documents", and "lacking documentation of change orders" as the main causes of failure in the contract management of Korean construction companies. This points to Korean construction companies' careless handling of contract-related tasks and highlights the necessity for enhancing the awareness of the importance of contract management and strengthening any related capabilities.

Against this background, this study was conducted to assess the contract management capabilities of Korean construction companies, identify the vulnerable aspects of current contract management, and systematically derive some key items worthy of close consideration as an important measure for strengthening their international competitiveness. To achieve these objectives, the process of contract management was redefined based on a literature review and expert interviews, while the capabilities required for implementing the related tasks were derived in relation to each stage of the process. For the assessment of Korean construction companies' current performance level in

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connection with contract management, a questionnaire survey was conducted with international contract management experts from four high ranked Korean contractors in terms of international sales, with preference given to those working in overseas contracting departments from their home offices. All the questions in the questionnaire were derived from a contractor's standpoint, focusing on the building sector and construction contracts only (and excluding design-build, turnkey, EPC and so on). The analysis of the questionnaire was divided into two parts; the first questionnaire analysis was designed to identify major capabilities considered important by experts, while the second questionnaire analysis was designed to evaluate capability deficits in the current contract management of Korean construction companies. This was done using the Analytic Hierarchy Process (AHP) technique, paired samples t-test, Borich Needs Assessment Model (BNAM), and Locus for Focus Model (LFFM). Then, comparative analysis of the results of both analyses was performed to derive the items that could strengthen the contract management competitiveness of Korean construction companies. The findings of this study can serve as important reference points for establishing strategic directions for strengthening contract management capabilities for overseas construction projects. While this study was concerned primarily with major companies in Korea looking for international contracts in the building sector, the analysis process and method can be utilized for the self-assessment of individual companies of varying sizes or specialties.

2. Literature Review on Contract Management

2.1 Discussion of the Contract Management Process

Dai (2009) stated that contract management should be implemented throughout the project and that each stage of contract management has its specific tasks and priorities. He divided contract management into two stages: establishment of the contract and implementation of the contract, with the former subdivided into bidding and contract negotiation stages, and the latter into construction and maintenance stages. Van Weele (2013) divided the contract management process into three stages: pre-contractual, contractual, and post-contractual stages, and defined the nine tasks specific to each of these three stages. He highlighted the interrelatedness of these sub-steps and the importance of understanding the status of the previous step to identify the problems of the current step. He also noted that the experience of contract management in one project influences the initial stage of the next project. Liu *et al.* (2014) pointed out that the stages in the traditional contract management process are not interlinked and suggested a new contract management process consisting of contract planning, contract signing, contract performance, and contract closure. This process description contains detailed definitions of each stage such as the contract selection and the post-completion contractual issues. However, most of these studies take the owner's standpoint not the contractor's. Moreover, existing studies on the contract management process make theoretical classifications of its stages, and need to be redrafted

by the contractor to reflect practical aspects in a more concrete and systematic manner.

2.2 Issues Related to Contract Management

Murdoch *et al*. (2008) called attention to the tendency of some owners to reflect various risks in the contract, in effect transferring those risks to contractors, which leads to an increasing number of contractors employing systematic contract management. Such intentional risk transfer by owners should be counteracted with wise contract management throughout the project stages, but the reality is that this is not usually the case. Kim *et al.* (2013) identified Korean construction companies' ten major failure patterns in overseas contracts, listing such things as repetitive mistakes, negligence in contracting, and lack of contractual knowledge and skills. He also argued that many of these problems may arise from "insufficient understanding of foreign cultures", or from "lacking communication between the contracting parties." Kim *et al.* (2012) described Korean construction companies' inadequate contract and claim management performances in each of the bidding, contracting, construction, and test operation stages, pointing to the lack of contract management experts as the main problem. Jergeas et al. (1994) stipulated six guidelines as a measure to overcome the contractual difficulties encountered by contractors in the North American construction market, including "continuous site documentation of all processes and works implemented," "clear understanding of the contract documents," and "quantification of the results of change orders." Hassanein *et al.* (2008) examined the status of claim management to set up strategies for improving claim management skills from a contractor's standpoint in Egypt, and highlighted the importance of "enhancement of claims documentation and filing procedures," "contract awareness by site team," and "unified quantification of changes." Taken together, the results of these studies are fairly similar in presenting which factors are problematic or important to avoid contractual failure. However, they do not seem to suggest how to improve contract management skills and capabilities.

2.3 Project Management Capabilities

Spencer and Spencer (1993) defined capability as individual traits leading to successful job performance, and Vathanophas (2007) noted that capability can be a measure for differentiating between superior and average performers. On the other hand, corporate capability can be categorized into personal and organizational capabilities. Personal capabilities are the core behavioral traits that an employee should have to successfully fulfill the assigned tasks, and can be defined as an integral whole of knowledge, skills, attitudes, motives, and physical and emotional characteristics (Bae *et al.*, 2007). While personal capabilities can be categorized into various capability areas, the general trend shown in a number of studies including those of Lee *et al.* (2009), Kim (2014), and Ahadzie *et al.* (2014) is to classify them into work-related and work-irrelevant capabilities depending on whether they are directly related to job performance or not. Organizational capabilities show different patterns according to

the organization's tangible and intangible assets and their management methods and processes, and can be enhanced when personal capabilities are efficiently incorporated into the overall organizational capability (Kim and Jeon, 2006). In his case study, Kim (2006) concluded that project performance is positively related to organizational capabilities that are proportional to the sum total of personal capabilities. These discussions imply that various aspects of the Korean construction companies' contract management capabilities should be systematically assessed and evaluated in other ways because they are the most important success factors in managing construction contracts, which are rarely investigated.

3. Derivation of Overseas Construction Project Contract Management Processes and Required Capabilities

3.1 Definition of Contract Management and the Stages for Capacity Analysis

Prior to deriving overseas construction project contract management processes in detail, it is necessary to clearly define contract management and set its scope. In its narrow sense, contract management is the implementation of contractual items set out in the contract documents. However, it is reasonable to expand its scope to the pre-contract stage because a lot of time, effort, and money will be spent leading up to the signing of the contract. That is, contract management should be considered throughout the project stages (Parsons, 2006).

The contract management processes in this study were derived via the following procedure. First, a literature review was performed to determine and define the stages of contract management, where major tasks and items of contract management were derived for each stage. The results of these processes were then corrected and complemented using five overseas project experts each with over ten years' experience. Finally, the process was broken down into three stages (bid preparation, contract signing, and contract implementation & closing), 18 major tasks, and 47 capabilities as shown in Table 6.

The first stage–bid preparation–consists of the acquisition of project information, the decision to participate in the bidding procedure, and bid submission. A taskforce is organized to proceed with the bidding process and feasibility, profitability, and risk of the project. These factors are evaluated based on the owner's demands by looking into the invitation to bid (ITB). Based on the analysis and evaluation outcomes, decision makers decide whether to participate in tendering for the project. After a positive decision has been made, the preparation and submission of bid documents is undertaken.

After the bid submission, if selected as the preferred bidder, the contractor designates a negotiator for all post-tender negotiations with the owner. When the negotiation is successful, the bidder receives a letter of acceptance (LOA). The contract documents are finalized after receiving the LOA and both parties sign a contract. However they spend time reflecting on all items to be considered in the project before the final contracting. The contractor then prepares beginning construction work by subcontracting and planning on-site construction. All the tasks taking place from post-tender negotiation to on-site construction planning belong to the second stage of the study, the "Contract signing and preparation stage". We included the tasks pertaining to the drafting and signing of the contract documents in the contract signing stage to make a clear distinction in the sequence of contract management.

The final stage of contract management is defined as "Contract implementation & closing". It extends from the construction start until the company's release from all contractual obligations by receiving the final certificate from the owner. While most of the tasks of the first and second stages can be arranged in a sequence along a timeline, the tasks and activities in this stage can happen concurrently with the construction work as shown in Table 6.

3.2 Derivation of Contract Management Capabilities

Capabilities required for carrying out the major tasks and activities in each stage were divided into personal and organizational ones. The former includes occupational capabilities such as the knowledge and skills necessary for executing the respective tasks and the latter are the capabilities of an organization, such as its resource level, resource management, and system process. But while some of tasks or activities may be separately classified as personal or organizational capabilities, some are related to the both. This classification system is presented in Table 6.

Basically, capabilities are defined as descriptions to achieve the purpose of particular activity which were verbalized with verbs and nouns. For example, "picking out the irrational conditions in the contract" for the task "ITB review" involves three personal capabilities; 1) thoroughly understanding various international standard contract documents, 2) recognizing and picking out any irrational or ambiguous conditions of the contract, and 3) predicting the effects of the conditions of the contract on the entire organization. Furthermore, three organizational capabilities are required: 1) sharing the cases of success and failure of contract management, 2) deriving major management indicators based on various example cases, and 3) maintaining a team of experts with long-standing experience in contract management. In this manner, 59 personal and organizational capabilities were derived and then regrouped into five personal and two organizational capability clusters (see Table 7). Personal capability clusters included "communication", "data collection and management", "contract document interpretation", "contract-related theories and knowledge", and "strategies and processes for contractual tasks". "Human resource management" and "system management" comprised the organizational capability clusters (see Table 8).

4. Analysis Methods for Contract Management Capabilities

4.1 Questionnaire for the Analysis of Contract Management Capabilities

To assess Korean construction companies' contract management

Table 1. Distribution of Survey Respondents

Career	Under 5 years	Over 5 years~ Under 10 years	Over 10 years~ Under 15 years	Over 15 years	Total
Work experience	0	20	23	49	92
	0%	22%	25%	53%	100%
Overseas construction projects experience	35	32	18	7	92
	38%	35%	20%	8%	100%

Table 2. Overview of Data Analysis Methods

Questionnaire analysis	Objectives of the questionnaire	Methodology
Part 1	Determining the importance level of the capability clusters perceived by the experts using pairwise comparison method	AHP
Importance between capability clusters		
Part 2	Identifying the weak areas of contract management capabilities of Korean construction companies by assessing the actual performance levels of the capabilities and their required performance levels (importance).	Paired samples t-test
Analysis of susceptible contract management capabilities		Borich Needs Assessment Model
		Locus for Focus model

capabilities for overseas construction projects, we surveyed 92 experts from the four biggest Korean construction companies using online or face-to-face surveys in September and October of 2015. Most of the respondents held at least senior manager positions, and dealt with international bids and contract management for building construction projects from their home offices. While some of them had less than 5 years' experience in overseas construction projects, their experience in the domestic market was regarded as sufficient to compare and judge their capability levels. Furthermore, we run the t-test to find if there was discrepancies between the different experience period of the respondents to the capability questions (less than 10 year experience and more than 10 years). The results showed that p-values of only four out of 59 capabilities (PC-B03, PC-C03, PC-D01, PC-D04) were lower than 0.05, which meant there were significant differences. However, since the purpose of the study was not to investigate such difference and the discrepancies seemed minimal, further analyses were conducted for overall answers and capabilities.

While the sample size may appear limited, it was deemed sufficient to deliver meaningful findings. This survey focused on four major companies, where a limited number of employees worked in the particular department, and one of the purposes of the study was to suggest an effective assessment method and to model contract management capabilities.

The questionnaire for the survey consisted of two parts in order to assess two different domains. Part 1 was designed to examine the perceived importance levels of the capability clusters presented in Table 7 using the method of pairwise comparisons between the capability clusters. Part 2 was designed to assess the current performance levels of the capabilities of each cluster by measuring the gap between the actual performance levels and their respective perceived importance levels. They were measured on a 5-point Likert scale.

4.2 Survey Data Analysis Methodologies

Data obtained from Part 1 of the questionnaire were analyzed to determine the relative importance levels of the required capabilities, and data obtained from Part 2 were used to identify the weak areas of contract management capabilities. Further, a comprehensive comparative analysis of the two parts was performed. Various methodologies were employed for these analyses. Table 2 outlines the contents, objectives, and methodologies of the analyses performed in this study.

4.2.1 Analytic Hierarch Process (AHP)

AHP is an analytic decision-making method by experts and is based on the stratification of the attributes of the given problems. To perform an AHP, a hierarchical structure should be constructed.
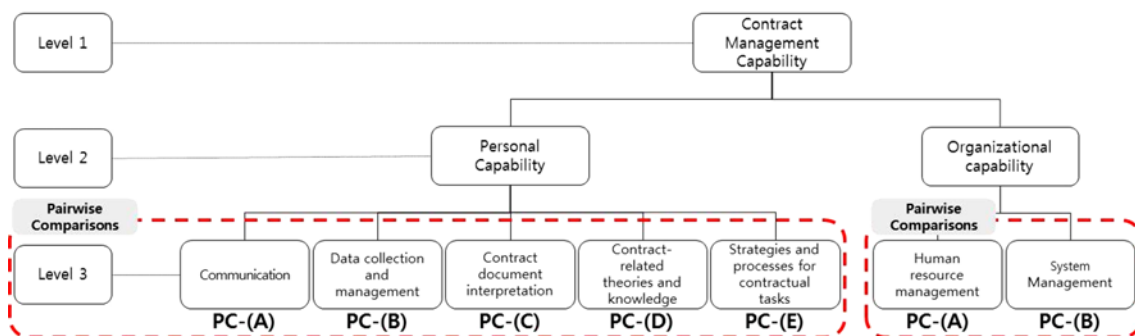

Fig. 1. AHP Hierarchical Structure

Fig. 1 represents the decision hierarchy in this study. The pairwise comparisons for Level 2 were not made because it was considered important to equally reflect personal and organizational capabilities in order to strengthen the assessment of the contract management capabilities of Korean construction companies. The Consistency Index (CI) of the AHP procedure is an indicator of the consistency with which the questionnaire items were answered. The higher the CI value, the lower the credibility of the questionnaire results. The widely applied cut-off CI value is 0.1, where responses in excess of this value were considered untrustworthy.

4.2.2 Paired-samples t-test

A paired-samples t-test is a statistical technique used for testing the statistical significance of the mean difference between two variables measured within a given group. In this study, it was used to check whether the gap between the experts' self-assessed importance, on the one hand, and the current performance level of each capability, on the other, shows any statistical significance. Although statistically significant differences depend on the pre-set significance level, differences meeting the significance level (p-value) of 0.05 or lower are usually considered statistically significant.

4.2.3 Borich Needs Assessment Model (BNAM)

The Mean Weighted Discrepancy Score (MWDS) of the Borich Needs Assessment Model is a score obtained by multiplying the importance of each capability by the discrepancy between the current level and its importance (Eq. (1)). MWDS is thus a valid measure of decision-making or for determining the priority level of each capability. That is, a capability with a higher priority level is considered to have a higher discrepancy between the current performance level and its importance, which may need to be improved.

$$MWDS = \frac{\Sigma(imporance - current \ peformance \ level) \times mean \ importance}{Total \ number \ of \ respondents} \quad (1)$$

4.2.4 The Locus for Focus Model (LFFM)

The Locus for Focus Model is an analysis method using a coordinate plane to highlight visual effects. The x- and y-axes represent the mean of importance value and the discrepancy between the importance and current performance levels, respectively. The coordinate plane is divided into four quadrants; the first with high importance and large discrepancy between the two levels (HH), the second with low importance and large discrepancy (LH), the third with high importance and small discrepancy (HL), and the fourth with low importance and small discrepancy

(LL). If certain capabilities with higher scores or higher ranks in BNAM are located in the first quadrant of the LFFM, they take priority over the other capabilities to be improved preferentially and intensively. However, BNAM ranks count as much as the values of the capabilities in the first quadrant. For example, since 19 personal capabilities are located in the LFFM first quadrant in this study, capabilities up to the 19th in BNAM will have priority.

5. Analysis Results of Korean Construction Companies' Contract Management Capabilities

5.1 Importance Analysis Via Comparisons between Capability Clusters

The AHP results confirmed that all answers from respondents were consistent (CI ≤ 0.1). Of the personal capability clusters, "contract document interpretation" was given the highest weight (0.261) followed by "strategies and processes for contractual tasks" (0.259), "contract-related theories and knowledge" (0.176), "data collection and management" (0.160), and "communication" (0.145). Interestingly, the two highest-weighted personal capability clusters show similar weighting in contrast to the other three. This may be ascribable to the awareness of the direct relevance of the first two capability clusters to project performance outcomes, whereas the other three were not recognized as visible contribution factors. Of the organizational capabilities, "human resource management" was ranked higher than "system management."

5.2 Priority Analysis of the Contract Management Capabilities

The paired-samples t-test results revealed statistically significant differences between actual and required individual performance levels in all capabilities (p < 0.05). This implies that there exists discrepancies in every capability area between its current performance level and its importance level. Importantly, according to BNAM, the top 5 personal capabilities, scored from highest to lowest, were as follows:

1. PC-A02: No difficulties writing contract documents and other types of documents in a foreign language.
2. PC-A03: No difficulties using contract-related terms in a foreign language and understanding the intention of other parties
3. PC-E07: Drafting claim-related documents in a systematic and strategically efficacious manner
4. PC-B03: Collecting/outlining/processing supporting data to prove the causes of a claim which the owner arouse
5. PC-D05: Thoroughly understanding the laws and systems of the project region

Table 3. AHP Results

Personal capability (CI:0.005)					Organizational capability (CI:0.000)	
Communication (PC-A)	Data collection and management (PC-B)	Contract document interpretation (PC-C)	Contract-related theories and knowledge (PC-D)	Strategies and processes for contractual tasks (PC-E)	Human resource management (OC-A)	System management (OC-B)
0.145	0.160	0.261	0.176	0.259	0.540	0.460

Table 4. Result of t-test, BNAM (MWDS) and LFFM (Personal capability)

Capability		Current performance level			Importance			t-value	BNAM (MWDS)	Priority level	LFFM
		Mean	Standard deviation	Rank	Mean	Standard deviation	Rank				
Communication	PC-A01	3.109	0.858	12	4.380	0.660	4	12.252*	5.571	14	HH
	PC-A02	2.739	0.888	40	4.337	0.700	7	14.611*	6.930	1	HH
	PC-A03	2.848	0.960	33	4.391	0.611	3	15.156*	6.778	2	HH
	PC-A04	2.967	0.907	26	3.772	0.827	39	8.767*	3.034	36	LL
	PC-A05	3.022	0.770	22	4.304	0.707	12	11.816*	5.521	15	HH
	PC-A06	3.130	0.773	11	4.130	0.801	25	10.104*	4.130	31	LL
	PC-A07	3.163	0.816	10	4.098	0.878	28	8.570*	3.831	32	LL
Data collection and management	PC-B01	2.924	0.917	30	4.272	0.743	15	13.082*	5.758	12	HH
	PC-B02	3.380	1.025	2	4.533	0.544	1	11.246*	5.222	18	HH
	PC-B03	3.043	0.901	17	4.478	0.654	2	12.715*	6.425	4	HH
	PC-B04	3.554	0.803	1	4.228	0.728	16	6.800*	2.849	38	HL
	PC-B05	3.054	0.976	14	4.380	0.709	4	11.160*	5.809	11	HH
	PC-B06	3.000	0.914	23	4.348	0.733	6	11.929*	5.860	9	HH
	PC-B07	2.967	0.977	26	4.109	0.703	27	10.088*	4.689	23	LH
	PC-B08	3.076	0.975	13	4.326	0.713	9	11.367*	5.408	16	HH
	PC-B09	2.761	0.732	38	3.957	0.838	33	10.703*	4.731	21	LH
	PC-B10	3.185	1.016	8	4.207	0.764	19	7.686*	4.298	30	HL
Contract document interpretation	PC-C01	3.380	0.875	2	4.152	0.740	24	6.188*	3.204	35	HL
	PC-C02	3.196	0.880	5	4.228	0.786	16	9.138*	4.366	29	HL
	PC-C03	2.935	0.887	29	4.315	0.645	10	12.404*	5.957	7	HH
	PC-C04	3.054	0.747	14	4.293	0.719	13	11.902*	5.320	17	HH
	PC-C05	3.043	0.888	17	4.120	0.709	26	9.046*	4.433	27	LL
	PC-C06	2.978	0.838	25	4.337	0.774	7	13.020*	5.893	8	HH
	PC-C07	3.196	0.815	5	3.957	0.824	33	6.443*	3.010	37	LL
	PC-C08	2.924	0.842	30	4.283	0.701	14	13.632*	5.819	10	HH
	PC-C09	2.815	0.755	35	4.043	0.769	31	11.341*	4.966	19	LH
	PC-C10	3.033	0.763	21	3.957	0.740	33	9.198*	3.655	33	LL
Contract-related theories and knowledge	PC-D01	2.772	0.757	37	3.554	0.856	42	7.322*	2.782	39	LL
	PC-D02	3.239	0.817	4	3.717	0.881	41	4.355*	1.778	42	LL
	PC-D03	3.043	0.863	17	3.772	0.827	39	6.078*	2.747	40	LL
	PC-D04	2.946	1.010	28	4.065	0.768	30	8.487*	4.551	25	LL
	PC-D05	2.761	0.869	38	4.207	0.734	19	13.051*	6.081	5	HH
	PC-D06	2.859	0.705	32	4.207	0.719	19	12.937*	5.670	13	HH
	PC-D07	3.196	0.952	5	3.859	0.897	38	5.393*	2.558	41	LL
Strategies and processes for contractual tasks	PC-E01	2.989	0.655	24	4.076	0.715	29	11.616*	4.431	28	LL
	PC-E02	2.826	0.979	34	4.000	0.812	32	8.512*	4.696	22	LH
	PC-E03	3.054	0.790	14	4.174	0.673	23	11.934*	4.673	24	HL
	PC-E04	2.815	0.769	35	4.228	0.713	16	15.205*	5.975	6	HH
	PC-E05	2.717	0.580	41	3.880	0.693	37	13.675*	4.513	26	LH
	PC-E06	3.174	0.956	9	4.315	0.662	10	9.995*	4.925	20	HH
	PC-E07	2.609	0.825	42	4.207	0.719	19	14.467*	6.721	3	HH
	PC-E08	3.043	0.838	17	3.913	0.751	36	8.659*	3.403	34	LL
total mean		3.012	0.854	-	4.145	0.741	-	-	4.737	-	

*Significance probability from the t-value is lower than 0.05 ($p<0.05$), which means that the gap between the experts' self-assessed importance and the current performance level of each capability shows statistical significance.
[PC-C09] is ranked No. 19 in BNAM priority level, but does not exist in the first quadrant of LFFM.
[PC-E06] exists in the first quadrant of LFFM but is ranked No. 20 in BNAM priority level.

These capability areas are primarily associated with foreign language skills and claim preparation.

On the other hand, the low-scored capabilities, in reverse order, are:
1. PC-D02: Understanding various types of invitation to bid, bidding, and bid award
2. PC-D07: Understanding various methods of dispute resolution
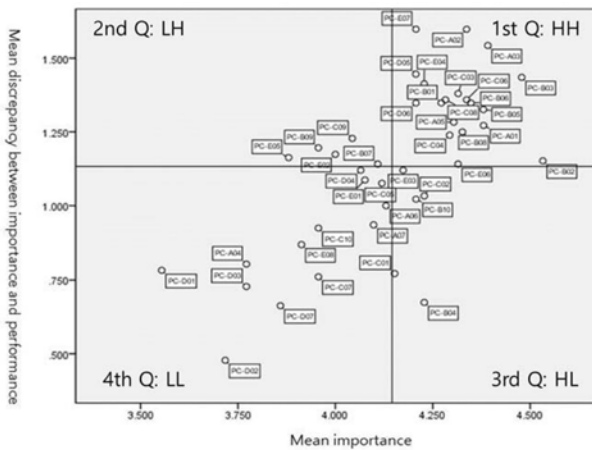3. PC-D03: Understanding technical terms and abbreviations

Fig. 2. Result of LFFM (Personal Capability)

commonly used in the field of contract

4. PC-D01: Understanding the theoretical and academic concepts of contract management.
5. PC-B04: Managing and archiving the supporting data related to advance payment of the owner or subcontractors.

Many of the low-priority capabilities, according to the Borich Model, pertain to the cluster "contract-related theories and knowledge", which was considered to have a low importance and a high current performance level. The low importance levels

of these capabilities may be due to their low relevance to on-site contractual tasks during construction work.

Looking at the graph plotting the discrepancies between the importance and performance levels of the capabilities using the LFFM, the 19 capabilities included in the first quadrant were ones whose mean importance of sub-capabilities was 4.145 and the mean discrepancy between importance and performance was 1.133.

Eighteen personal capabilities are included both in the first quadrant of the LFFM and highly ranks in BNAM as in Table 4. Examples are: "command of foreign languages" for the capability cluster "communication," "archiving all kinds of supporting documents" and "keeping quantitative records of change orders" for the capability cluster "data collection and management," "picking out irrational contract conditions" and "thoroughly understanding the contract documents" for the capability cluster "contract document interpretation," "thoroughly understanding the laws and systems of the project region" and "understating the contractual relationship between the contracting parties" for the capability cluster "contract-related theories and knowledge," and "clarifying the hidden contractual intention during negotiations" and "strategically drafting claim documents" for the capability cluster "strategies and processes of contractual tasks". These capability clusters have thus been identified as the weaker areas of Korean construction companies' contract management capabilities.

Table 5 presents the 17 capabilities prioritized in the BNAM,

Table 5. Result of t-test, BNAM (MWDS) and LFFM (Organizational capability)

Capability		Current performance level			Importance			t-value	MWDS	Priority level	LFFM
		Mean	Standard deviation	Rank	Mean	Standard deviation	Rank				
Human resource management umuman resource management	OC-A01	2.391	1.079	14	4.207	0.638	1	16.143*	7.636	1	HH
	OC-A02	2.413	0.928	13	4.130	0.759	2	16.152*	7.094	2	HH
	OC-A03	2.283	0.701	17	3.902	0.630	7	17.752*	6.320	3	HH
	OC-A04	2.522	0.895	9	3.891	0.805	8	12.090*	5.329	9	LH
	OC-A05	2.370	0.874	15	3.891	0.845	8	12.261*	5.922	4	LH
	OC-A06	2.598	0.962	6	3.859	0.779	11	9.830*	4.865	11	LL
	OC-A07	2.576	0.880	7	3.717	0.869	16	9.995*	4.243	15	LL
System management	OC-B01	2.424	0.788	12	3.859	0.806	11	12.715*	5.536	7	LH
	OC-B02	2.641	0.909	5	3.989	0.777	4	10.780*	5.377	8	HH
	OC-B03	2.500	0.896	10	3.793	0.833	14	11.890*	4.907	10	LL
	OC-B04	2.467	0.919	11	3.750	0.834	15	11.157*	4.810	12	LL
	OC-B05	2.533	0.748	8	3.978	0.679	5	13.312*	5.751	6	HH
	OC-B06	2.337	0.868	16	3.848	0.825	13	11.988*	5.814	5	LH
	OC-B07	2.978	0.994	1	3.924	0.774	6	7.510*	3.711	16	HL
	OC-B08	2.946	1.052	2	3.696	0.781	17	5.858*	2.772	17	LL
	OC-B09	2.717	0.918	4	3.880	0.796	10	9.107*	4.513	14	LL
	OC-B10	2.837	0.893	3	4.022	0.798	3	9.820*	4.765	13	HL
total mean		2.561	0.900	-	3.902	0.778	-	-	5.257	-	

*Significance probability from the t-value is lower than 0.05 ($p<0.05$), which means that the gap between the experts' self-assessed importance and the current performance level of each capability shows statistical significance.
[OC-A05] is ranked No. 4 in BNAM priority level, but does not exist in the first quadrant of LFFM.
[OC-B02] exists in the first quadrant of LFFM but is ranked No. 8 in BNAM priority level.
[OC-B05] exists in the first quadrant of LFFM but is ranked No. 6 in BNAM priority level.
[OC-B06] is ranked No. 5 in BNAM priority level, but does not exist in the first quadrant of LFFM

wherein capabilities pertaining to "human resource management" are generally shown to have higher priority levels as compared to "system management." Of the organizational sub-capabilities, the top 5 ranks are as follows:

1. OC-A01: A large team of skilled and experienced contract management experts
2. OC-A02: A large proportion of contract management experts with construction engineering skills
3. OC-A03: A large team of personnel with expertise in the laws and systems of the project region
4. OC-A05: Continuing education in contract and claim management
5. QC-B05: Maintaining up-to-date data relating to the laws and systems of the project region

The capability areas related to the lack of contract management experts were analyzed as having the highest priority levels, thus demonstrating the susceptibility of the corresponding capabilities. The lower-scored capabilities were most of those belonging to the capability cluster "system management":

1. OC-B08 Developing and managing major standard subcontracting documents
2. OC-B07 Setting up a document management system for systematic management/archiving of contracts and other documents
3. OC-A07: Identification and sharing of new competency areas required for strengthening contract management capabilities
4. OC-B09: Setting up a claim management system at the headquarter level
5. OC-B10: Outlining the main contract management issues of the given project and data-processing/storing the related data

In the same manner as described previously, the graph plotting the discrepancies between the importance and performance levels of capabilities using the LFFM shows that the mean importance is 3.902 and the mean discrepancy between importance and performance is 1.342, with 5 capabilities included in the first quadrant.
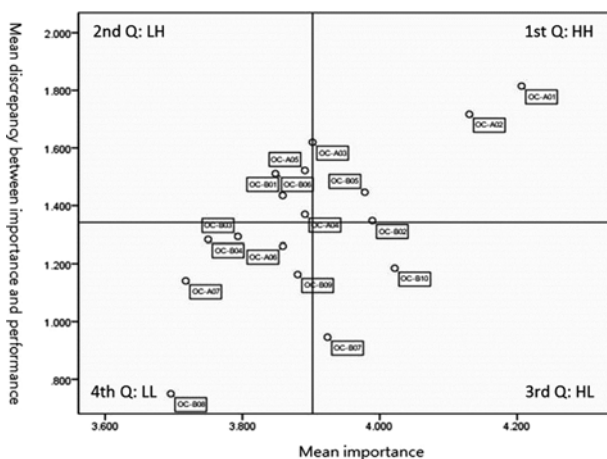

Fig. 3. Result of LFFM (Organizational Capability)

Three capabilities (OC-A01, A02, A03) were identified as first priority items in both the BNAM and the LFFM. They are all associated with the cluster "human resource management." Contract management case analysis, acquisition of legal and institutional data, and acquisition of classified subcontractor data by type of work were revealed to be secondary priority items in need of improvement.

5.3 Discussion of the Findings

Taking a closer look at the analysis results, paradoxically, the top 20 high-priority personal capabilities determined by the Borich Model include 4 capabilities belonging to the "communication" cluster and 6 belonging to "data collection and management" with relatively low AHP weights, which account for 50% of the high-priority ones. This implies that there exists a discrepancy between the capabilities considered important in the AHP results and the capabilities with high importance and low performance levels in the BNAM results. This is significant in that such a gap can be a disturbing factor in any effort to improve contract management capabilities. Additionally, similar contradictory results are also found in the organizational capability clusters. The following clusters represent critical findings that require greater attention.

5.3.1 Communication: Lacking Command of Foreign Language and Communication

Of the personal capability clusters, "communication" exhibited the lowest weight in the AHP but its capabilities were highly prioritized in the BNAM. In particular, PC-A02 (No difficulties writing contract documents and other types of documents in a foreign language) and PC-A03 (No difficulties using contract-related terms in a foreign language and understanding the intention of other parties) were identified as critical capabilities, showing a large discrepancy between performance and importance levels. Given that every contract document is written in, and project negotiations are conducted in, a foreign language, the gap between AHP and the BNAM results is very contradictory. This implies that despite the awareness of the importance of foreign language competency, its importance is not reflected in contract management.

Although not presented in the analysis results above, a large number of experts selected "communication" as a major problem, pointing to their inadequate communication with the project owners. In interviews, they noted the general tendency of Korean construction companies to solve minor problems themselves without involving the owners due to the custom of avoiding conflicts on account of petty problems. However, this is a harmful custom that can make a small problem develop into a large problem, and is likely to turn out to be a major cause of failure in contract management in the long run.

5.3.2 Data Collection and Management: Lacking Supporting Site Data Management Capability

The capability cluster "data collection and management" also had a low weight in the AHP, but corresponding capabilities

were selected most frequently as the capabilities in need of improvement. Further, 6 of 10 capabilities exhibited high importance levels and were plotted in the first quadrant in the LFFM showing a large performance–importance gap. The contents of the capabilities positioned in the first quadrant are mostly focused on the onsite supporting data collection and management capabilities. This result suggests that the onsite supporting data collection and management capabilities are weaker than what is actually perceived. In this regard, many experts pointed out that the onsite documentation is kept only as mere formality. This attitude makes it difficult for them to collect accurate data on important contract-related issues of the given project and hampers efforts to enhance competitiveness in contract management.

5.3.3 System Management: Necessity for Establishing a Quantitative Contractual Database

A large number of respondents considered the capabilities pertaining to the personal capability cluster "contract document interpretation" as the most important, giving it the highest weighting in the AHP. Since the ultimate goal of contract management is the management of a contract's conditions, it is essential to predict the risks involved in them. In order to make accurate, risk-related judgments, both personal and organization-level supports are important. And yet, the awareness of organizational support was found to be low. Interestingly, while the BNAM shows a high MWDS for the necessity of experts in terms of contract document interpretation, the MWDS for system management was low. Examples include low-priority capabilities such as OC-B02 (In case of site conditions deviating from the drawing, preparing supporting data by recording each point, ranked 8 out of 17), OC-B03 (Collecting/outlining/processing supporting data to prove the causes of claim attributable to the owner, ranked 10 out of 17), and OC-B10 (Updating and monitoring of regular schedules on the construction site, ranked 13 out of 17). This may be attributable to the tendency to regard the task of detecting irrational clauses in contract documents and rating their risks as a domain to be handled by experts, and so pay little attention to quantitative data collection required for carrying out that task. Lack of quantitative data can lead contract managers to rely largely on empirical knowledge even when they are aware of unfavorable contract conditions, meaning that they cannot sufficiently estimate the risks involved. System management should operate in a supportive manner to facilitate an accurate interpretation of contract documents and effective risk prediction, and such databases should be established to concretize experts' judgments.

5.3.4 Human Resource Management: A Necessity for Efforts to Train High-caliber Contract Management Experts

The results of the BNAM and the LFFM show a large gap between the awareness of the importance of maintaining a contract management expert team (OC-A01–A03) and the low demand for training programs for human resource development in contract management (OC-A04–07). In particular, the analysis

results for determining the importance levels of capabilities revealed that the importance of human resource development in contract management (OC-A04–07) ranked lower than 3.902, the overall mean importance of the organizational capabilities. This result is indicative of Korean construction companies' short-sighted attitude of avoiding corporate efforts for related human resource development, on the one hand, while recognizing the urgent need for contract management experts, on the other. It is an unwise makeshift solution to secure external experts to temporarily overcome the lack of contract management capabilities while continuing to neglect internal human resource development.

6. Conclusions

Contract management is a very challenging endeavor for Korean construction companies entering the foreign market. Although many studies have taken up this issue, most of them operated from the owner's standpoint rather than from the contractor's, and further dealt either with theoretical breakdowns or just evaluated importance or weaknesses of the factors in general. It is critical that the industry assess critical capabilities and take meaningful steps to improve them practically.

This study defined the contract management process and then derived the contract management capabilities required at each step. Based on this foundation, a questionnaire survey was conducted with contract management experts to investigate any discrepancies between the perceived importance of capabilities and the current performance level according to the AHP procedure, the Borich Needs Assessment Model, and the Locus for Focus Model. Some findings targeted here may appear similar with those of other studies, especially in terms of capability clusters. However, our findings indicate what capabilities need to be improved and outlines the discrepancies between perceptions and actual performance. For example, communication capabilities are an area demonstrating the widest gap between the results of the AHP analysis and the BNAM. "Data collection and management" also showed a wide gap between the AHP and the BNAM. The results also recommend maintaining a large team for contract management, or focusing on employing experts with engineering skills as much more important than other personal capabilities.

As a whole, the results of this study can serve as useful data for setting the strategic direction for strengthening Korean construction companies' contract management capabilities in the international construction market. Of course, there are limitations in that the study surveyed employees of a limited number of construction companies with a limited work scope. Further studies may be needed to deal with different aspects of the industry and to obtain objective outside opinions. However, this study was conducted using questionnaire-based qualitative methodologies, and a follow-up study is considered necessary to focus on a quantitative interpretation based on actual dispute and claim case studies. Besides the quantified results, the analysis process and method can be an effective toolkit for self-assessment of other individual companies of varying sizes or specialties.

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Appendix

Table 6. Contract Management Process (continued)

Key tasks	Major review items	Required capabilities*	
		Personal	Organizational
- Bid preparation stage -			
Feasibility study	Evaluating owner's credibility and legality.	-	○
	Analyzing the laws and systems of the project region.	○	○
	Examining the project scale and characteristics.	○	○
Task force team constitution	Setting the work scope of each team involved in the project.	○	○
	Setting the work scope of each company involved in the project in case of joint venture or consortium.	○	○
ITB review	Identifying owner's demands and evaluating their feasibility.	○	○
	Clarifying contractual parties' roles and rights/obligations.	○	-
	Understanding contractual terms and tackling unclear words.	○	-
	Picking out irrational contractual conditions.	○	○
	Outlining contractor's liability and indemnity clauses.	○	○
Site survey	Checking site-related risks and site conditions deviating from the contract documents.	○	○
	Checking the list of local subcontractors and their soundness.	-	○
Query transmission	Collecting contract-related problems and questions.	○	-
	Setting up strategies for questions to the owner.	○	○
Bid preparation & submission	Drafting and reviewing the bid form and annexes.	○	-
	Preparing and reviewing the bid bond documents.	○	-
	Checking the bid submission modality and date.	○	-

Table 6. Contract Management Process

- Contract signing stage -			
Post-tender negotiation	Setting up negotiation strategies and preparing/presenting contractor's alternatives in relation to negotiation items.	○	○
	Reviewing the terms and conditions set out in the signed contract and deriving items worth considering.	○	-
LOA reception	Releasing the bid bonds and submitting the advance payment and performance bonds.	○	-
	Discussing and establishing the master schedule.	-	○
Contract drafting /signing	Checking the contents of the signed contract documents.	○	-
Preparation and signing of contracts with subcontractors	Establishing the standard contract procedure and drafting standard contract documents.	○	○
	Establishing the contractual relationship with the owner (e.g. collateral warranty).	○	○
Preparation of construction start	Acquiring approvals/licenses issued by authorities concerned necessary for project implementation.	○	-
	Checking the advance payment dates and modalities.	○	-
	Checking the construction site occupancy/delivery plan.	○	-
- Contract implementation & closing stage -			
Claim management	Fulfilling the duty of immediate notification of a claim case	○	○
	Checking the justification of the claim raised	○	○
	Collecting and analyzing the supporting data to prove the reason of imputation of the claim	○	○
Reception of progress payments	Writing monthly request for progress payment and preparing supporting documents related to the progress	○	○
	Checking contractor's contractual rights in case of owner's non-payment of the progress payment requested	○	-
Variation-related work	Judging the justification of the owner's demand for variation	○	-
	Negotiating the variation-related additional cost and construction duration prolongation	○	○
	Archiving the variation-related supporting documents	○	○
	Documenting the verbal instructions on variation	○	○
	Writing the variation plan and estimating the construction duration and cost in case of contractor-initiated variation	○	○
Other management tasks	Strategic writing and management/archiving of the report to the owner	○	○
	Document management/archiving (reports and other construction documents, pictures and videos of the construction sites, meteorological data, etc.)	○	○
	Continuous updating and monitoring of the process table (schedule)	○	○
Tests on completion and receipt of taking-over certificate	Preliminary completion inspection and completion of all incomplete or non-conforming work indicated on the punch list	○	-
	Performing the notification and execution of completion inspection, completion of all items on the punch list	○	-
	Final check of all other contractual requirements	○	-
	Preparing supporting data for the statements of completion	○	○
Defects notification period	Rechecking the terms and conditions of the work for remedying defects and related cost funding	○	-
	Receipt of the warranty bond and retainage release	○	-
	Securing supporting data for the final specifications	○	○

*"○" marks the personal or organizational capabilities primarily required for handling the corresponding review item.

Table 7. Definitions of the Contract Management Capability Clusters

Category	Capability cluster	Code	Definition
Personal capability (PC)	Communication	PC-A	Capability to communicate with ease in the contract-related foreign language, prepare/deliver a presentation with confidence, and to work efficiently in a team.
	Data collection and management	PC-B	Capability to collect various data for the implementation of contract management, process data into meaningful datasets, and store/manage them.
	Contract document interpretation	PC-C	Capability to clearly understand the contract documents of the given project, pick out irrational contractual conditions, and make various decisions related to such conditions.
	Contract-related theories and knowledge	PC-D	Capability to theoretically back up the implementation of contractual works irrespective of management project based on generally applicable knowledge.
	Strategies and processes for contractual tasks	PC-E	Capability to clearly understand contract management work processes and set up various contractual strategies for the minimization of risks of project/contract management.
Organizational capability (OC)	Human resource management	OC-A	Capability to maintain human resources to improve contract management capabilities and continuously promote professionalism of staff by providing various training opportunities and fostering a culture of learning.
	System management	OC-B	Capability to gather various contract-related data and process them into databases, and to develop and manage various systems and processes to facilitate work processes.

Table 8. Definitions of the Contract Management Sub-capabilities

Capability clusters		Capabilities required for competency level	Capability areas		Definitions of required knowledge and skills
Personal capabilities			Knowledge base	PC-D04	Thoroughly understanding various international standard contract documents (e.g. FIDIC).
Communica-tion	PC-A01	No difficulties reading and understanding foreign language contract documents and other types of documents.		PC-D05	Thoroughly understanding the laws and systems of the project region.
	PC-A02	No difficulties writing contract documents and other types of documents in a foreign language.		PC-D06	Understanding owner-contractor-subcontractor contractual relationships and estimating/counteracting related risks.
	PC-A03	No difficulties using contract-related terms in a foreign language and understanding the intention of other parties.		PC-D07	Understanding various methods of dispute resolution.
	PC-A04	Preparing presentations in a logical manner and clearly expressing the intended meanings.	Operational strategy and process	PC-E01	Understanding contract management process and the effects of the current task on the entire project.
	PC-A05	Clearly conveying core issues to contracting parties during an official presentation.		PC-E02	Clearly identifying owner's demands and judging their feasibility on the basis of ITB.
	PC-A06	Conducting smooth teamwork among contract team members for the successful implementation of the project.		PC-E03	Formulating strategically reflected questions arising from the ITB review and communicating them to the owner.
	PC-A07	Understanding and adopting foreign contract culture.		PC-E04	Finding out hidden contractual intentions of the other contracting parties during negotiation
Data collection and management	PC-B01	Thoroughly reviewing and interpreting the contractual clauses offered by the owner when reviewing the ITB.		PC-E05	Setting the negotiation level with strategic considerations of the effects of the results on the organization.
	PC-B02	In case of site conditions deviating from the drawing, preparing supporting data by recording each point.		PC-E06	Implementing the contractual work pursuant to the procedure and deadline set out in the contractual terms.
	PC-B03	Collecting/outlining/processing supporting data to prove the causes of claim which the owner arouse		PC-E07	Drafting claim-related documents in a systematic and strategically efficacious manner.
	PC-B04	Managing and archiving the supporting data related to advance payment of the owner or subcontractors.		PC-E08	Drafting reports to the owner in a systematic and quantitative manner.
	PC-B05	Preparing supporting data by quantitative documentation of financial loss incurred by owner's change orders.	Organizational capabilities		
	PC-B06	Preparing supporting data by documenting financial and time losses when change orders affect other work processes.	Human resource management	OC-A01	A large team of skilled and experienced contract management experts.
	PC-B07	Preparing supporting data by documenting financial and time changes incurred by the work proposed by the contractor.		OC-A02	A large proportion of contract management experts with construction engineering skills.
	PC-B08	Documenting the oral instructions of the owner or supervisor and managing and archiving them.		OC-A03	A large team of personnel with expertise in the laws and systems of the project region.
	PC-B09	Managing and archiving video and meteorological data besides reports.		OC-A04	Establishment of an educational system for human resource development in contract management.
	PC-B10	Updating and monitoring of regular schedules in the construction site.		OC-A05	Continuing education in contract and claim management.
Contract document interpretation	PC-C01	Discerning basic contractual roles, rights, and obligations of contractual parties as specified in the contract.		OC-A06	Establishment of a career development path (CDP) to train high-caliber contract management personnel.
	PC-C02	Understanding the accurate contractual meanings of the termed used in the contract documents.		OC-A07	Identification and sharing of new competency areas required for strengthening contract management capabilities.
	PC-C03	Picking out irrational or ambiguous clauses and predicting their effects on the project.	System management	OC-B01	Obtaining the up-to-date data on the characteristics and contractual tendencies of major owners.
	PC-C04	Outlining and classifying contractual liabilities and indemnities of the contractor.		OC-B02	Analyzing and sharing success and failure cases of contract management.
	PC-C05	Judging the reasonability of all insurances and bonds required in the contract documents.		OC-B03	Deriving major management indicators on the basis of various contract management cases.
	PC-C06	Understanding the contents of the signed contract and clarifying contractual characteristics or key points.		OC-B04	Setting up internal contract-related communication system to support contract management tasks and provide data.
	PC-C07	Correcting and writing major subcontracts based on the main contracts.		OC-B05	Maintaining up-to-date data related to laws and systems of the project region.
	PC-C08	Clearly defining the contents of a claim and its justification based on the contract.		OC-B06	Maintaining up-to-date data (soundness, technicality) related to subcontractors of the project region by work type.
	PC-C09	As the site manager, understanding the rights exercisable by the contractor when the owner fails to meet his obligation.		OC-B07	Setting up document management system for systematic management/archiving of contracts and other documents.
	PC-C10	As the site manager, understanding the obligations of the contractor to accurately judge the justification of owner's instructions.		OC-B08	Developing and managing major standard subcontracting documents.
Contract theories	PC-D01	Understanding the theoretical and academic concepts on contract management.		OC-B09	Setting up claim management system at the headquarter level.
	PC-D02	Understanding various types of invitation to bid, bidding, and bid award.		OC-B10	Outlining the main contract management issues of the given project and data-processing/storing the related data.
	PC-D03	Understanding technical terms and abbreviations commonly used in the field of contract.			

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