

A Study of the impacts of control types on Tie strength and Project Performance - focus on field project organization of construction industry

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[Abstract]

In this paper, we an empirical study of the effects of control types on Tie strength and filed project performance of project participants in field project organization for Korean domestic construction industry. In the study, we try to tell what significant impact output control, process control and tie strength among field project participants have on field project performance and features unique to field project organization for Korean construction industry through empirical analysis. And the findings of the empirical analysis are that output control appeared to have significant impacts on tie strength among the participants and process control, and process control also appear to have significant impact on field project performance.

▶ **Key words:** Tie strength, Output control, Process control, Project performance, Structural equation model

[요 약]

본 연구는 국내 건설산업의 현장프로젝트조직 사업 참여자를 대상으로 프로젝트 참여자 간 통제유형에 따라 유대 강도와 현장프로젝트 성과에 어떠한 영향을 주는지를 살펴보고자 하는 실증 연구이다. 본 연구에서는 산출통제(Output Control), 과정통제(Process Control), 현장프로젝트 사업참여기간 유대강도가 현장프로젝트성과에 어떠한 유의한 영향을 미치며 또한 한국 건설산업의 현장프로젝트조직만이 가지는 특징을 실증분석을 통하여 알아보하고자 하였다. 실증분석결과 산출통제(Output Control)는 사업참여기간 유대강도와 과정통제(Process Control)에 유의한 영향을 주며 유대강도는 과정통제(Process Control)와 현장프로젝트 성과에 유의한 영향을 주었으며 과정통제(Process Control) 역시 현장프로젝트 성과에 유의한 영향을 미치는 것으로 나타났다.

▶ **주제어:** 유대강도, 산출통제, 과정통제, 프로젝트성과, 구조방정식모델

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I. Introduction

Faced with the recent Korean government's continued restrictive real estate policy to curb speculative housing price hikes, Korean domestic construction companies need efficient management system to improve technology, profitability, and competitiveness. So efficient business control improvement appears to be an alternative strategy for the survival and growth of [1] construction company. Business management system of [2] construction industry is developing in various ways. Although the expert technology of each part, such as processes and cost control, has not changed, the roles and the partners of the participants are changing. We can frequently see merges of similar businesses for combined control or the emergence of complex business for the same purpose. So, futuristic strategy is necessary in such changing environment, and more versatile approaches for business projects and performance measurement have become one of the major objectives for future construction industry. In light of the importance that the performance of business projects results in the performance of the construction company, collaborative system for lasting competitive advantage is necessary with strengthened tie among the participants, as well as improved construction capability and technology, to achieve the basic objective of construction projects. There have been increasing efforts to analyze and interpret the management of organizations for which collaboration is prerequisite, from the perspective of social networks. Regarding the interpretation of the effects of social networks on organizations, variables, such as tie strength, in particular, are considered important.[3] Tie strength indicates the level of mutual solidarity and cohesiveness since frequent contracts and sense of closeness can be useful tool for mutual collaboration and dedication beyond mutual understanding. In the study, we try to figure out relationship between tie strength

among participants in construction field project organization and the performance of field project through causal relationship analysis by classifying the control types for tie strength as output control and process control.

II. Theoretical Background

It comes to important elements to consider for the objective of an organization, behavior of some members can be inconsistent with the objective of the organization even though the company has excellent members to achieve desirable outcome or preset organizational objective. In this case, one of desirable approaches can be motivation for its members to achievement its set objective.[4] control can be employed to induce collaborations among the departs or individuals of the organization and efforts and challenge to achieve specified organizational objective. According to the empirical study of effects and roles of controls on the performance of international joint venture by [5], controls appear to have significant impact on mutual collaborations among the participants, and the types of process control and social control appear to have significant impact on joint venture performance. Control is defined as "a process that system components constitute predictable composition based on the set criteria".[6]

seems That is, the purpose of control is to direct behaviors toward the ultimate objective of the organization as expected. Control is, therefore, employed to make the achievement of the objective of the company predictable, and the level of conviction for expected result can be enhanced with control.[7]. [8] said in his study of the cooperation that "when business partners are able to control each other with appropriate methods and laws, acknowledged risk for their partners can be mitigated and mutual trust can be improved, and such trust can lead to synergy effect through exchange and combination of their core potential

and resources". Tie strength is one of the most used concepts in the study of social networks, and it measures the strength and stability of relationships with their partners of social networks. [9]

According to the study of the effects of tie strength between companies on knowledge attainment and integration and innovation performance by [10], it is confirmed that the interactions of strong tie and weak tie are both found to have positive impact on knowledge attainment and integration. According to the study of the role of formal and nonformal controls of strategic alliance between companies by [11], process control appears to have impacts on business performance. According to the empirical study of adjusting impact of control types on relationship between tie strength and joint venture performance by [12], tie strength with business partners has significant impacts on business performance; output control does not appear to regulate relationship between tie strength and business performance; process control does not appear to have adjusting role but does appear to have significant direct impact; and social control appears to have significant regulatory role for tie strength and business performance. The finding confirms that information sharing and tie strength between business participants, especially construction company field project organization where multiple companies participate in particular, are closely related with field project performance.

III. Research Method

1. Research Model and Hypotheses

The purpose of the study is to empirically confirm how control types (output control, process control) among the participants in Korean domestic construction field project organization impact tie strength and field project performance.

In this study, making use of the existing findings, the hypotheses are as follows.

Hypothesis 1: output control will have positive impact on tie strength among the project participants.

Hypothesis 2: output control will have positive impact on process control.

Hypothesis 3: tie strength among project participants will have positive impact on process control.

Hypothesis 4: tie strength among the project participants will have positive impact on project performance.

Hypothesis 5: Process control will have positive impact on the project performance.

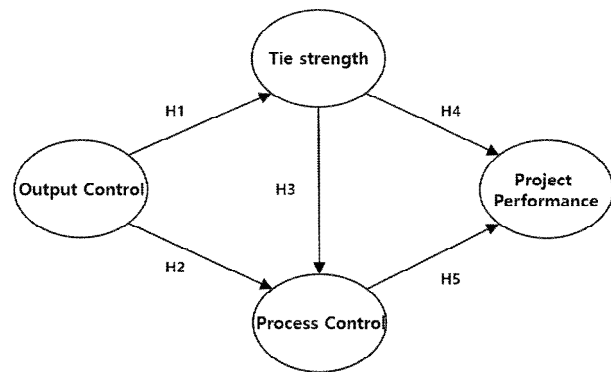


Fig. 1. Research model and Hypothesis

2. Sampling

Total 300 copies of questionnaires are distributed among the personnel who work at Korean domestic construction field project organizations for the study, and 287 questionnaires are collected in total for statistical analysis except for the irresponsible 13 questionnaires (collection ratio 95.6%).

The findings of frequency analysis of the sample demographic are presented in the <Table 1> below.

Male respondents are 243(81%) and female respondents are 57(19%) of the total 287 respondents. Regarding the age distribution, the largest age bracket is 30s (42.2%) and the next largest age bracket are 40s (32.4%), 50s (9.1%) and 20s (15.6%), respectively. 30 ~ 40s takes up 74.6% of the total personnel. 65.5% of the respondents are married, with 34.5% single. Regarding their education level, high school graduates are 21

Table 1. General characteristics of the sample

	Division	Total (unit: persons)	Ratio(%)
Gender	Male	243	81
	Female	57	19
	Division	Total (unit: persons)	Ratio(%)
Marital status	Married	188	65.5
	Single	99	34.5
Age	20s	45	15.6
	30s	121	42.2
	40s	93	32.4
	50s	26	9.1
	60 or more	2	0.7
Education level	High school graduate	21	7.3
	2 year-college student/graduate	68	23.7
	4-year university student/graduate	175	61
	Graduate school or more	23	8
Position	Director (board member)	42	14.6
	Deputy head /head of department	47	16.4
	Acting chief/chief of section	125	43.6
	Associate/chief of subsection	73	25.4
Year of employment	1 year or less	31	10.8
	2~3 years	75	26.1
	4~5 years	60	20.9
	6~7 years	121	42.2
Department	Technology part (civil engineering/building/plant)	125	43.6
	Management part (planning/personnel/general affairs/accounting/funding)	36	12.5
	Overseas business (headquarters)	7	2.4
	Sales part(housing/development/marketing)	15	5.2
	Field part	96	33.4
	Others	8	2.9

(7.3%), 2-year college graduates are 51(21.0%), 4-year university graduates are 156 (64.2%), and graduate school graduates or beyond are 13(5.3%), so that 4 university graduates or beyond were more than 64% of the total. When it comes to their position, the largest group is acting section chief/section chief as 125 (43.6%); subsection manager/chief group is 73 (25.4%); deputy department head/department head group was 47 (16.4%) and board member group is 42 (14.6%), the sample, therefore, shows even distribution across their positions. Regarding the years of employment, 6~7-year bracket is 121 (42.2%); 2~3-year bracket is 75(26.1%); 4~5-year bracket is 60 (20.9%); and 1 year or less bracket is 31 (10.8%).

Lastly, regarding their departments of employment, technology department (civil engineering/building/plant) is 125 (43.6%); field work is 96 (33.4%); management (planning, personnel, general affairs, accounting, funding) is

36 (12.5%); sales (housing/ development/marketing) is 15 (5.2%); others is 8 (2.9%); and overseas (headquarters) is 7(2.4%).

IV. Results

1. Exploratory Factor Analysis

For this study, Exploratory Factor Analysis is carried out with SPSS Windows 23.0 and the confidence interval is estimated with Cronbach's alpha>0.6. Principle Component Analysis is employed for Factor extraction and Varimax Rotation is used for the factor rotation. The questionnaire items are modified in line with the purpose of the study. Single dimensional factor analysis is conducted for the Factor Loadings (FL>0.6) that represents correlations between the evaluation factors.

Table 2. Results of exploratory factor analysis

Item	Factor1	Factor 2	Factor 3	Factor 4	Cronbach's α
output control	.859 .847 .845 .720 .699 .634 .599				0.92
tie strength		.878 .845 .839 .752			0.935
process control			.896 .832 .819 .791		0.692
project performance				.899 .892 .876 .849 .774	0.952

First, exploratory factor analysis is conducted for the questionnaire items, using the SPSS 23.0, and this has resulted in the extraction of the 4 factors that are output control, tie strength, process control, project performance.

2. Analysis of the Structural Model

Correlations are used to represent how the factors are related each other [13]. Covariance structure analysis is employed in the study to analyze their correlations between the 4 factors that are output control, tie strength, process control, project performance.

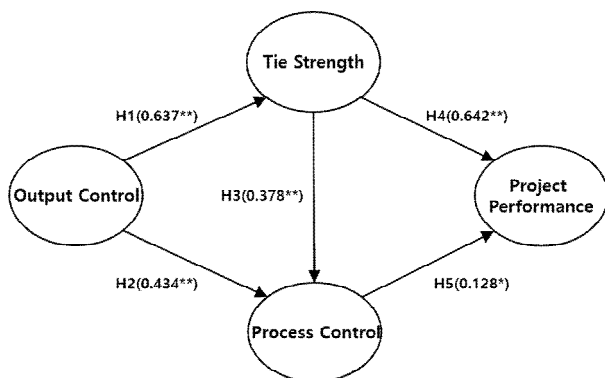


Fig. 2. Research Results

The structural model testing with AMOS 18.0 for the correlations between all the actors has resulted in $\chi^2 = 1.451(df=1)$, $p = 0.000$, $\chi^2/df = 1.451$, $GFI = 0.996$, $RMR = 0.018$, $NFI = 0.996$, $AGFI = 0.964$, $CFI = 0.999$, and general goodness-of-fit indicators, GFI , $AGFI$, RMR , CFI , $RMSEA$, etc. were confirmed to meet all of the standard values.

The <Table 2> and <Table. 3> show standardized coefficients and significance levels. According to the findings of the study, output control is found to have positive effects on the tie strength(H1) and process control(H2), tie strength is found to have positive effects on the process control(H3) and project performance(H4), process control(H5) is found to have positive effects on the project performance.

Table 3. Results of hypotheses

Hypothesis	Path	FL	t-value	p-value	Hypothesis Supported
H1	Output Control→ Tie Strength	0.637	11.648	0.000	**
H2	Output Control→ Process Control	0.434	6.95	0.000	**
H3	Tie Strength→ Process Control	0.378	6.054	0.000	**
H4	Tie Strength→ Project Performance	0.642	10.069	0.000	**
H5	Process Control→ Project Performance	0.128	1.999	0.046	*

*: $P < 0.05$, **: $P < 0.01$, ns: not significant

V. Conclusions

The findings can be summarized as follows: Output control has positive impact on tie strength (H1) among the business participants and process control (H2); tie strength has positive impact on process control (H3) and field project performance (H4); and process control has positive impact on project performance (H4).

These findings are in line with the existing studies in which controls and tie strength among

the participants in field project organization have significant impact on the field project performance. And the academical, empirical meaning lies with the confirmation that appropriate control system deems necessary among the business participants for successful execution of construction industry field projects and differentiated application of different control types to obtain or improve project performance. But there are some limitations with the study that the research data for the study of the controls and tie strength among the business participants for Korean domestic construction company field project organization are heavily skewed toward civil engineering (60.2%), while the ratios are 27.3%, 6.7%, 2.5% and 3.3% for housing and construction, plant, electricity and telecommunication, and others, respectively, so that they fall short of fair reflection of the characteristic of each business part of overall general construction industry field project organizations. For future studies, therefore, analyses of more data of broader range of fields are necessary for fair reflection of field characteristics of construction projects.

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