Master of Science in Engineering

Organizational Structure and Varying Performances of the Construction Industry in Korea

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Abstract

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Construction industry, along with other sectors, have been impacted by the rapid change of environment such as economic, finance, and other uncontrollable factors. Due to the changes in the environment, organizational performance is effected causing the organization to either prosper or suffer. As a result of the change in the environment and effect on the performance, organizational structure becomes the indirect medium that connects both environment and performance. Hence, this research aims to analyze the construction companies' organizational structure in order to define a holistic relationship between organizational structure and performance based on a constant environment (e.g. 2008 financial crisis).

In order to solve this question, subcategories (threshold, new ideas,

superior's attitude, information sharing, job description, cooperation, decision making and superior's power) from main factors (formalization, complexity, centralization) of organizational structure was extracted. Then, a survey was distributed among thirteen construction companies which results were analyzed using gap analysis and comparison analysis. Through this process, it is possible to determine which subcategories (organizational structure) have an effect on organizational performance.

The result of this study showed that there was a linear relationship between the factors of organizational structure and performance. Organizations with higher a) freedom of choice (formalization) and b) information sharing (complexity), the better the company performed. Therefore, this research would contribute to other Korean construction companies by allowing them to reflect on their organizational structure in order to enhance their performance.

Keywords: Construction Industry, Organizational Structure, Organizational Performance, Environment

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Chapter 1. Introduction

1.1 Research Background and Objective

After the financial crisis of 2008, many industries, including the construction industry, had gone through economic turmoil. The recession caused the construction sector to shrink in a global rate (Martin, 2009). Ever since the recession, the total value of orders received in many industries had decreased causing a ripple effect on the construction industry in Korea. Globally, many construction companies were able to survive the international crisis; however, even more companies had to adjust to keep the company's balance to a positive. The result of the recession pushed construction companies to their limit causing negative effect on the company's image. Due to the lack of demand in the construction sector, fierce competition between the contractors lead to low bids with little or no benefit (Arditi et al., 2000). Furthermore, the changes in the organization ranged from organizational reconstruction (i.e. downsizing) to merge and acquisition in order to cope with the environmental change (i.e. economic turmoil, change in demand, etc.). After the 2008 recession, nonetheless, a distinctive trend can be seen within the Korea construction industry. Figure 1 represents the top construction companies in Korea since 2003 up to 2013. The companies were labeled as CO(#) for privacy. As seen in Figure 1, by observing the top construction

companies in Korea that survived the economic turmoil in 2008, two clusters of companies existed by comparing the total value of order from 2003 up to 2013: the advancing companies and slowly developing companies. Despite the recession of 2008, a number of companies were able to excel whereas others had a slow growth.

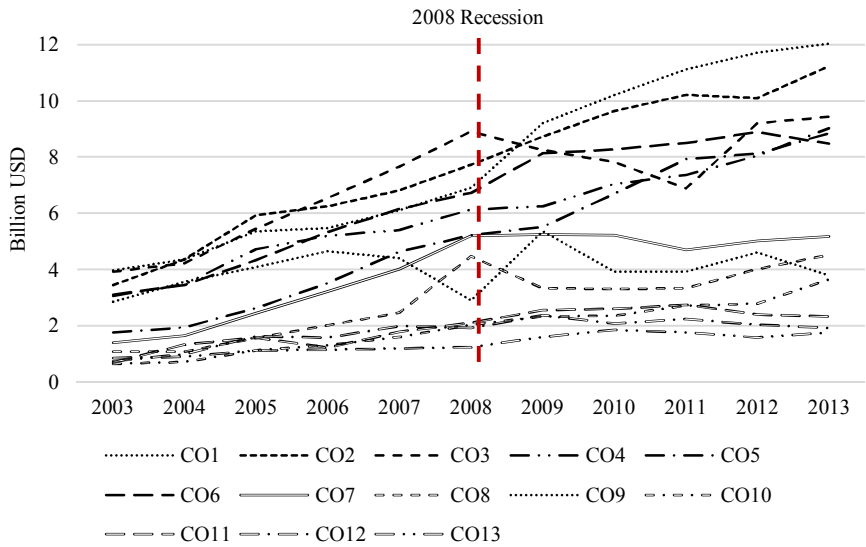

Fig. 1. Construction Companies in Korea

As mentioned earlier, global construction sector had suffered through the same event that occurred during the 2008 recession. Therefore, the recession of 2008 would be a common factor among all the construction companies. However, in the Korean construction industry, it was possible for a few companies to do much better than others in terms of the total value of order. Especially, the difference between the companies became more distinctive ever since the 2008 economic turmoil. The cause of this can be explained as

organizations have different organizational characteristics although being involved in the common sector (e.g. construction industry); hence, it is evident that the organizational structure would be different. As a result, the difference in organizational structure, culture, and other factors, it would be possible to have varying organizational performance (Van de Ven, 1976).

Nevertheless, for a company to be able to adjust its organizational structure according to the environment in order to excel in organizational performance would be more than difficult as the relationship between organization and environment is more than complex. An organization cannot simply decide its structure solely depending on the environment. Although the environment has an effect on the organization's structure, organizational performance is another factor that an organization cannot overlook as it drives the organization to success. Thus, the environment becomes a precedent factor for the organizational structure (Kumar et al., 1995; Mohr et al., 1996) and a balance between the environment and organizational performance is essential (Drazin and Van de Ven, 1985; Venkatraman, 1989) for the success of the company. Furthermore, organizational characteristics (i.e. goals, strategy, etc.), which are a determinant factors for organizational performance, are innate within the organizational structure. As a result, determining the characteristic of an organization and comparing each organization with its structure and performance, it would be possible to determine which organizational structure is more effective. As seen in Figure 2, the complex relationship of the three

factors make it difficult for the organization to create a structure that is optimal for both the environment and performance. However, by simplifying the diagram in Figure 2, as the environment effects the organizational performance indirectly, organizational structure can be seen as a function where the environment is the input whereas the performance is the output as seen in Figure 3.

Fig. 2 Complex Relationship of the Organization (Kang, 2012)

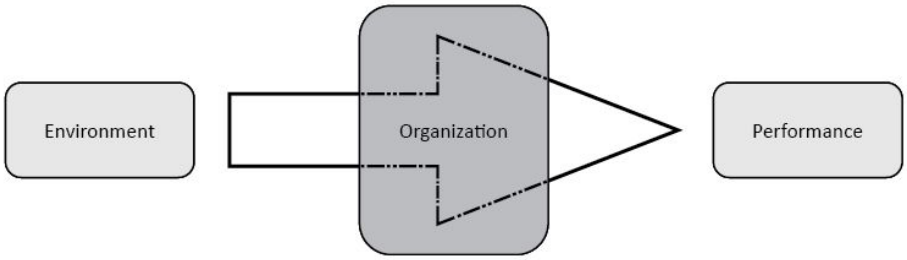

Fig. 3 Relationship of the Organization with Performance and Environment

Finding the optimal balance for the organizational structure between environment and performance can differ depending on the type of industry and its focus. For example, a construction company that focuses on its market only in the national level may not have the suitable structure to support business in a global scale. On the other hand, another construction company may have the appropriate organizational structure for international business. The two construction companies ultimately have different organizational structure, yet they may still perform extraordinarily within their field. Furthermore, for an organization to focus mainly on the environment can lead to the organization's internal deterioration. Meanwhile, focusing on organizational performance will lead the organization to neglect the environment causing the organization to deteriorate (Drazin and Van de Ven, 1985; Venkatraman, 1989). The wide range of field within the construction industry makes it even more difficult to evaluate what type of organizational structure performs the best within its limitations (e.g. external environment). As a result, this research attempts to answer the question of "which organizational structure factors in the Korean construction industry have an effect on organizational performance?" and "what factors are the cause for the organization (company) to be more successful than others?" By answering the two questions above, it would be possible to suggest which key factors of an organization may need to alter for the enhancement of the organizational performance.

1.2 Research Methodology

For this study, preliminary studies on environment, organizational structure, and organizational performance was conducted. After extracting main factors for organizational structure, the factors were further subcategorized in order to specify the main factors. Subcategories were utilized for the development of a survey that determined the characteristics of an organization. Once the database was created, gap analysis was utilized and model that analyzed the relationship between organizational structure and performance was developed.

Gap analysis is a method which compares the actual and expected (potential) performance of an index. Initially, it is utilized to determine how well an organization is performing and how it could improve based on the surveyor's response. The result of the survey is graphically represented such that the difference between the actual and expected performance can be seen. As a result, this study uses gap analysis to determine the difference between construction companies and analyze which factors for the two groups (advancing companies and slowly developing companies) exists.

As mentioned above, after the 2008 financial crisis, the Korean construction industry had shown a trend where two groups of construction companies began to divide. The group was composed of the top thirteen construction companies which were extracted from the construction ability

evaluation ranking (Construction Association of Korea, 2013). As the top thirteen companies were represented a substantial amount (more than 85%) of the order received in the construction sector, other companies that were comparatively low were negated.

The two groups of companies, totaling of thirteen companies, were selected for survey and further analysis. As for the survey respondents, due to the characteristic of organizational structure, survey was mainly subjected to the high decision-making personnel or workers above the section chief.

As a result, the research process can be defined in five steps as shown in Figure 4.

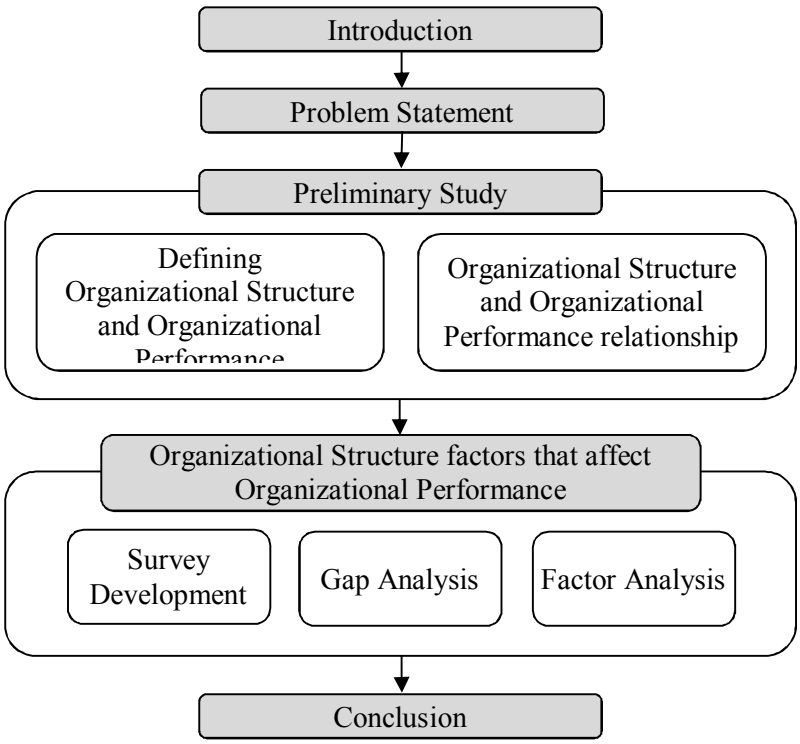

Fig. 4. Research Process

Chapter 2. Previous Study

This chapter deals with previous studies that defined the meaning of organizational structure and performance. Organizational performance may depend on many factors; however, various scholars and researchers have focused on three main factors: external environment, organizational structure and organizational performance. The three factors were determined to be the main factors as it described as the macro category of organizational structure that explicitly views the characteristic of an organization. To be able to determine the type of a relationship among environment, organizational structure and organizational performance, factors need to be extracted in order to define a proper relationship. Therefore, the relationship between organizational structure and performance is also discussed in this chapter.

2.1 Theories on External Environment, Organizational Structure and Organizational Performance

Previously, Child (1972) had described environment, organizational structure and organizational performance in a very macro level. He was able to define that there is a complex relationship among the three factors in which each factor is codependent of one another. Furthermore, many theories focused on how an organization is formed such as contingency theory, evolution theory, leadership theory etc. The theories later developed into ideas that were expanded (Lawrence and Lorsche, 1967; Miles et al., 1978; Lawrence and Dyer, 1983), leading other researchers to approach the relationship among environment, organizational structure and organizational performance. For example, Kim et al. (2012) conducted a research that proved external environment had an effect on organizational performance due to the organizational structure. Meanwhile, Chung et al. (2008) had approached whether the fit among environment, strategy and organizational structure has an effect on the organizational performance. He concluded that the relationship exists between environment and strategy, and environment and structure whereas strategy and structure is not as well supported. Up to date, there are many research that is similar to this study but with a focus on non-construction sectors. For the following sections, further study on the external environment, organizational structure, and organizational performance will be discussed.

2.2 Defining External Environment

There have been many underlining research that address external environment. Initially, factors that affect the organization or the organizational structure can be defined as the environment, which is further divided into heterogeneity and dynamic environment (Thompson, 1967; Child, 1972). Meanwhile, situation theory defines environment as a composition of various factors, such as technology, economy, etc. (Lawrence and Lorsche, 1967), exaggerating the fact that an organization must consider the environment when defining its goals, strategy and so forth (Sadler and Barry, 1970). Finally, there are quite a few other studies that defined the environment as the organization's resource (Pfeffer, 1972; Aiken and Hage, 1968).

Nonetheless, in order to determine how different types of organizational structures have varying performance under the same environment, this research focuses on the 2008 economic turmoil. As lack of demand in the construction sector and fierce competition between contractors lead to low bids with little or no benefit as mentioned before, this study attempts to unfold the relationship between organizational structure and performance based on the 2008 recession.

2.3 Organizational Structure Factors

Organization has been overly researched by many scholars since the economic boom and the recession in 1970s. An organization, in general, is seen as a combination of various factors (i.e. department size, strategy, goal, etc.) that shape it to be an organization. However, among the various definitions of what an organization is, as seen in Table 1, a number of studies focused on three main factors of an organization: formalization, centralization and complexity (Miller, 1987; Gibson et al., 1994; James and Jones, 1976; Child, 1972). This is due to the fact that formalization, centralization and complexity can be described as the macro category of organizational structure that explicitly views the characteristic of an organization; hence this study focuses on the three organizational structure factors. Furthermore, by utilizing the three factors mentioned above, it would be possible to compare the organizational characteristic of construction companies for this research. The three factors (formalization, centralization and complexity) can be defined as the following:

Table 1. Organizational Structure Factors

Researcher	Formalization	Complexity	Centralization	Scale	Control	Vertical/ Horizontal	Management
Child (1972)	●	●	●			●	
Hall (1962)	●	●					
Hall, et. al. (1968)	●	●					
Hickson, et. al (1968)	●				●	●	
Hrebiniak (1974)		●	●		●	●	
Indik (1968)	●	●	●	●			
Inkson, et. al. (1970)	●						
James and Jones (1976)	●	●	●	●		●	●
Payne & Mansfield (1976)	●	●	●			●	
Porter & Lawler (1965)			●	●	●	●	
Prien and Ronan (1971)	●	●	●	●			
Pugh, et. al. (1968)	●	●	●			●	●
Sells (1968)	●	●	●	●	●		

(Source: Dalton, et. al. (1980))

1) *Formalization* refers to how 'formal' an organization is. It can range from the mode of communication (i.e. verbal or paperwork), restrictions given to the worker (i.e. work description assigned to a particular worker), and other factors which describes whether the company is rigid or not. If an organization is said to be formalized, it can be interpreted as following the "textbook" and not so easily adopting to other ideas that go against the company's ordinary culture.

2) *Centralization* is defined as the power that is distributed to the lower parts of the organization by the decision makers. In simpler words, it can be described by the decision-making power that the lower ranking workers has in their position. A centralized organization is when the decision maker or the leader of the organization has the majority of the power, capable of controlling everything that happens within the organization.

3) *Complexity* can be described as the number of activities (i.e. job description, number of departments, etc.) within the organization. The concept can be most easily understood by the scale of an organization. When the organization expands, organization structure will change resulting in different types of tasks each department will handle. This can be seen as the organization becoming more complex.

As a result, the foundation of organizational structure can be summarized as formalization, centralization and complexity, which is utilized for this research. Nevertheless, the three factors will be further subcategorized in the following chapter due to the lack of specificity of the factors in describing the characteristics of an organizational structure.

2.4 Defining Organizational Performance

Performance is a factor that has different meanings due to the perspective of performance can vary from person to person. Currently, although there is a lack of research that clearly defines the relationship between organizational structure and performance (Dalton et al., 1980), a few studies defined the effectiveness of an organization and labeled it as organizational performance (Child, 1972; Price, 1968). However, there is a fine line that differentiates organizational effectiveness and performance which may not apply to every research. Meanwhile, Dalton (1980) categorizes performance as hard and soft; the former refers to the financial aspect of performance and the latter defines the physiological aspect of performance.

As this research focuses on the financial aspect of an organization, the hard aspect of performance defined by Dalton was adopted due to its objectivity and comparability to other organizations.

2.5 Relationship between Organizational Structure and Performance

According to Etzioni (1960), an organization is thought to be set depending on the environment, but an organizational structure requires an optimal balance between performance and environment (Brown and Duguid, 2001). Furthermore, a number of researchers emphasized the need to consider the environment when defining the organization's goals, strategy, etc. as it drives the organizational performance (Sadler and Barry, 1970; Pfeffer, 1972; Aiken and Hage, 1968). As a result, the structure of an organization can be seen to be essential in determining the organizational performance (Van de Ven, 1976) while a horizontal organizational structure is suggested in order to cope with the unpredictable environment (Kang, 2012). Furthermore, depending on how the organization is configured, organizational performance can vary (Bain, 1956; Caves, 1974; Porter, 1981; Scherer, 1970).

2.6 Summary

There were many research underlying the relationship between organizational structure and organizational performance. Also, some researchers proved that external environment had an effect on organizational performance. Regardless, previous studies focused on non-construction industry. Therefore, it can be said that due to characteristic difference of industries, previous studies does not necessarily apply to the construction industry. As a result, three main organizational structure factors were extracted from the preliminary research: formalization, complexity and centralization. Although other factors exists, the three factors were chosen due to its capability to describe the characteristic of an organization as a whole for this research.

Chapter 3. Research Framework

This chapter touched upon the subcategories derived from the main factors of organizational structure and how data was gathered and analyzed. There are many methods in gathering data but due to the subjectivity and ambiguity of the contents for this research, a questionnaire survey developed through a systematic approach in utilizing the subcategories to retrieve a valid response. The companies that were to participate in the survey were also selected based on the rankings of the construction industry (based on 2013) provided by the Ministry of Land, Infrastructure and Transport (MLIT). The results were then analyzed through the structure and performance model developed in the next chapter for this research which determines which subcategories are related to one another.

3.1 Factor Extraction

In order to conduct the research, three factors (environment, organizational structure and organizational performance) were analyzed. Initially, environment was seen as a constant factor, as the period of the research begins from the economic turmoil in 2008 and on. Furthermore, due to the fact that every construction company in Korea had to endure the same or similar effect from the environmental effect, it was possible to conclude that environment could be seen as a constant. As for organizational structure, the three main factors (formalization, centralization and complexity) mentioned above was chosen as they describe the characteristics of an organization in a broad term. However, as the three factors were generally defined by various researchers and scholars, each factor was subcategorized for a more precise assessment as seen in Table 2. The subcategories extracted were derived from the contents of formalization, complexity and centralization mentioned in the preliminary study.

Table 2. Organizational Structure Subcategories

Factor	Subcategory	Content
Formalization	F1 Threshold	The extent of freedom of choice that is given to a worker when dealing with work
	F2 New Ideas	How much the company can handle unconventional methods
	F3 Superior's Attitude	The extent of how much a superior is willing to help with workload
Complexity	Co1 Information Sharing	How much information is being shared within the department or coworkers
	Co2 Job Description	How much work variation (different type of jobs) is distributed to a person
	Co3 Cooperation	The amount of help a coworker is able to give to another person without incentive (free will)
Centralization	Ce1 Decision Making	The amount of freedom a worker is allowed to decide within the organization
	Ce2 Superior's Power	The amount of power the superior possesses in the company

Implying an organization is much *formalized* is not comprehensive enough to be able to define *how* an organization is formalized. Hence, three categories were extracted for formalization, which described 1) threshold; 2) new ideas; and 3) superior's attitude. Threshold describes the worker's ability to make a choice when dealing with work. If the worker cannot freely make decisions due to the characteristic of the organization, threshold will be measured as low and vice versa. New ideas can be measured as how much a company is willing to accept methods that are different from the traditional methods. If a company is not willing to accept untraditional methods, it will

be possible to say that new ideas will be measured low. Finally, superior's attitude describes how much the worker's superior is willing to help out workers in terms of workload. In a less formalized company, the superior would be willing to share the workload if it is necessary as a certain task is not limited to a worker(s). Therefore, as formalization refers to how 'formal' and 'stiff' an organization is, the three subcategories can describe the degree of formalization in different methods.

Similarly, complexity was also extracted into three categories: 1) information sharing; 2) job description; and 3) cooperation. Much like the subcategories of formalization, similar approach was taken in defining which categories would well define what complexity is. Information sharing refers to the degree in which company departments or workers are willing to share information with each other. If workers within the department or company are willing to share information, information sharing can be said to be high compared to workers who are not willing to let information go outside their management. Job description refers to the variety of tasks that is given to a single department or worker. When tasks are given to a worker that is not specialized but rather distributed in terms of the characteristic of the job, the level of job description would be high resulting to a more complex organizational structure. Finally, cooperation is defined as how much coworkers are willing to help out each other.

Finally, centralization was subcategorized into two subcategories:

decision making and superior's power. Decision making refers to the worker's ability to make decisions within the organization. Unlike threshold in formalization, decision making is different in the sense that decision making is the authority that is given to the worker, whereas threshold is the freedom of choice. Finally, superior's power can be defined as the authority that the superior has in the company. When more power is given to the superior and is not distributed within the organization, the superior's power can be said to be high, resulting to a more centralized organization.

As a result, a total of eight subcategories (3 - formalization; 3 - complexity; and 2 - centralization) were selected to represent organizational structure. As for organizational performance, objectivity of performance was needed in order to be able to compare construction companies. Hence, economic standpoint (i.e. profitability, growth, stability, etc.) that is considered as hard performance was preferred for this research. This research, therefore, considered the total value of orders received as the value for organizational performance.

3.2 Content Analysis

As the data for this research was survey-based, the expected and actual values, as mentioned above, were compared using gap analysis. Gap analysis, in general, visually shows the difference between the current and potential value of the factor in question. Once the trend for each company is determined, further investigation on the relationship between organizational structure and organizational performance is needed to determine how each company is actually *different* from one another, yielding to why the advancing companies may be performing better than the other group.

Consequently, a representative value (average of the actual value) for each company was extracted. Using Microsoft Excel, degree of freedom (df) (number of questions - 1) was calculated for each question based on the subcategories. Then, chi-square percentage was calculated based on the degree of freedom. Based on the representative value, the subcategories were standardized respectively which were then analyzed in the following order:

1) Comparison between Subcategory (F1, F2, F3, Co1, Co2, Co3, Ce1, and Ce2) - Performance ($)
2) Comparison between Subcategory - Subcategory (F-Co, F-Ce and Co-Ce)

3.3 Survey Development

A questionnaire was developed to further investigate the characteristics of each organization. The factors for the questionnaire were extracted using the eight subcategories derived in Table 2. The survey consists of only questions concerning the organizational structure. This is due to the fact that the setting for the environment was a constant factor (the 2008 recession) and the organizational performance was analyzed by comparing the construction ability evaluation ranking (Construction Association of Korea, 2013) as seen in Table 3.

Table 3. Ranking of Construction Companies since 2003 (Billion USD)

	2003	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
CO1	3.10	3.44	4.35	5.34	6.16	6.74	8.14	8.28	8.52	8.90	8.49
CO2	1.08	1.09	1.56	2.01	2.48	4.49	3.34	3.31	3.34	4.02	4.51
CO3	0.75	0.98	1.64	1.58	1.99	1.93	2.38	2.09	2.25	2.05	1.92
CO4	3.06	3.47	4.73	5.20	5.40	6.15	6.25	7.06	7.36	8.06	9.03
CO5	3.93	4.23	5.46	6.56	7.66	8.93	8.26	7.82	6.89	9.22	9.45
CO6	0.85	0.90	1.13	1.16	1.19	1.24	1.61	1.86	1.77	1.57	1.76
CO7	0.70	1.34	1.59	1.22	1.80	2.11	2.57	2.62	2.74	2.41	2.35
CO8	1.39	1.65	2.45	3.22	4.02	5.21	5.25	5.24	4.71	5.02	5.19
CO9	3.46	4.36	5.94	6.25	6.82	7.73	8.73	9.64	10.21	10.10	11.25
CO10	1.78	1.94	2.63	3.52	4.64	5.23	5.53	6.72	7.94	8.13	8.85
CO11	0.66	0.71	1.14	1.31	1.62	2.04	2.34	2.36	2.72	2.80	3.66
CO12	3.99	4.36	5.37	5.48	6.12	6.91	9.21	10.22	11.12	11.71	12.04
CO13	2.86	3.56	4.09	4.67	4.41	2.90	5.36	3.92	3.93	4.60	3.80

(Source: Ministry of Land, Infrastructure and Transport)

Furthermore, due to the fact that surveys are subjective and quantifying organizational structure may be unreliable, each question was measured twice on a 7-point Likert scale: surveyor's expected value of the company and the value the surveyor actually believes it to be. Also, each factor was composed of two questions, which overall represents the same factor. The composition of the questionnaire can be seen in Figure 5.

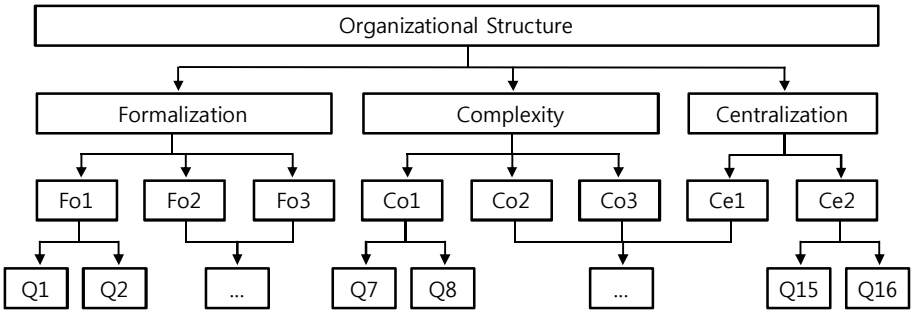

Fig. 5. Questionnaire Composition

As a result, the questionnaire was composed of a total of sixteen questions. Six questions measured three subcategories for formalization, six questions measured three subcategories for complexity, and four questions measured two subcategories for centralization.

3.4 Summary

This research suggests eight subcategories from the three factors (formalization, complexity and centralization) extracted from preliminary studies: three subcategories from formalization (threshold, new ideas and superior's attitude); three subcategories from complexity (information sharing, job description and cooperation); and two factors from complexity (decision making and superior's power). The subcategories were extracted in order to identify the organizational structure more descriptively. Then, the subcategories were utilized in developing a survey that was distributed to a total of thirteen construction companies. The construction companies were selected using the data from MLIT (based on 2013 figures).

Chapter 4. Research Outcome

This chapter discusses the results of the survey and how the survey results were analyzed. First, the analysis of the survey that was conducted utilizing the subcategories from the organizational structure factors. Then, gap analysis for the survey results were conducted which were then standardized and tested for validity of the data. After, through the analysis of the categories and performance of each individual firm, a relationship between organizational structure and organizational performance, which was also related to the environment (2008 economic turmoil), was found.

4.1 Survey Result

Total of thirteen Korean construction companies participated for the survey. The survey focused on the decision-making personnel (Chair members or high decision makers), with an average sample of twenty employees per company respectively for this research. Although twelve out of thirteen companies responded to the survey, only nine of the companies had sufficient response for this study to continue. The surveys were distributed through email where the surveyor had to respond to the questions online (Google Docs) without leaving any personal information. It was conducted for two weeks after the email was distributed, which were then processed for analysis.

4.2 Gap Analysis

The surveys were organized by company which visualized the characteristic of the firm. In order to compare each construction company to one another, gap analysis was conducted for each company. Figure 6 represents all the responses for Company 1 (CO1) to the subcategory questions derived from previous section which is organized by the larger factors: formalization, complexity and centralization. Meanwhile, Figure 7 also represents the average value of the answers to the subcategory for Company 1 (CO1). Similarly, Figure 8 and Figure 9 show the characteristic of Company 3 (CO3). Such discrepancy of the graph between each company exists, due to the fact that each company has a different organizational factors (goals, size, strategy, etc.). Therefore, it was possible to identify the subtle differences between one company to another. Nevertheless, it was difficult regardless to conclude that one company was better than another through the graphs.

By comparing the results for each company, it was possible to observe that majority of the respondents viewed their company to be composed of an organizational structure that is more formalized (closer to 1), less complex (closer to 7) and less centralized (closer to 7) organizational structure. This result can interpreted as the employees of the company believe the company to be close minded, sharing and less rigid. Also, as seen in Figure 6, 7, 8 and 9 the actual value reflected lower (average of 1 point) than the expected value.

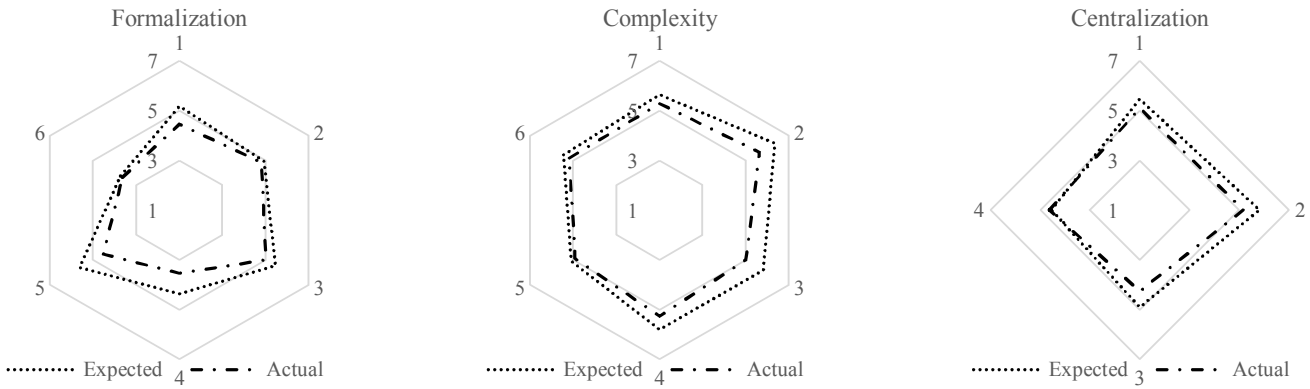

Fig. 6. Characteristic of a Company Sample (Overall - CO1)

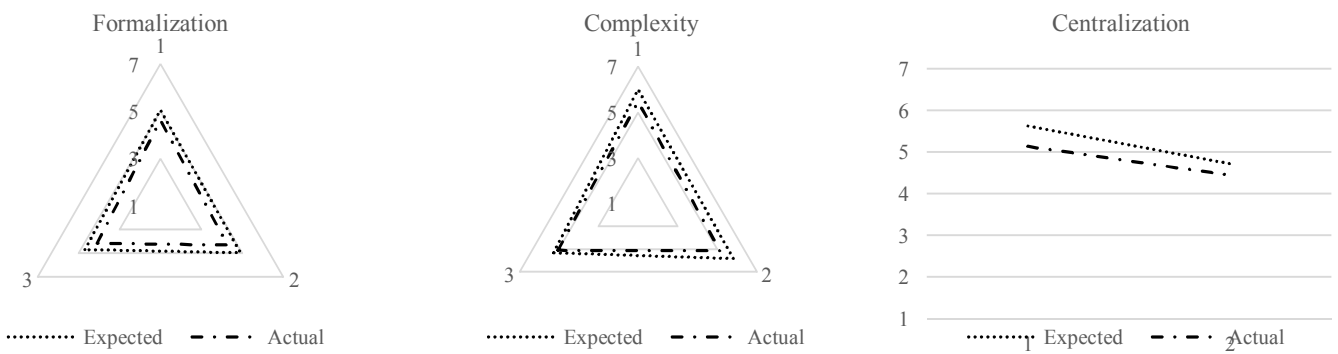

Fig. 7. Characteristic of a Company Sample (Average - CO1)

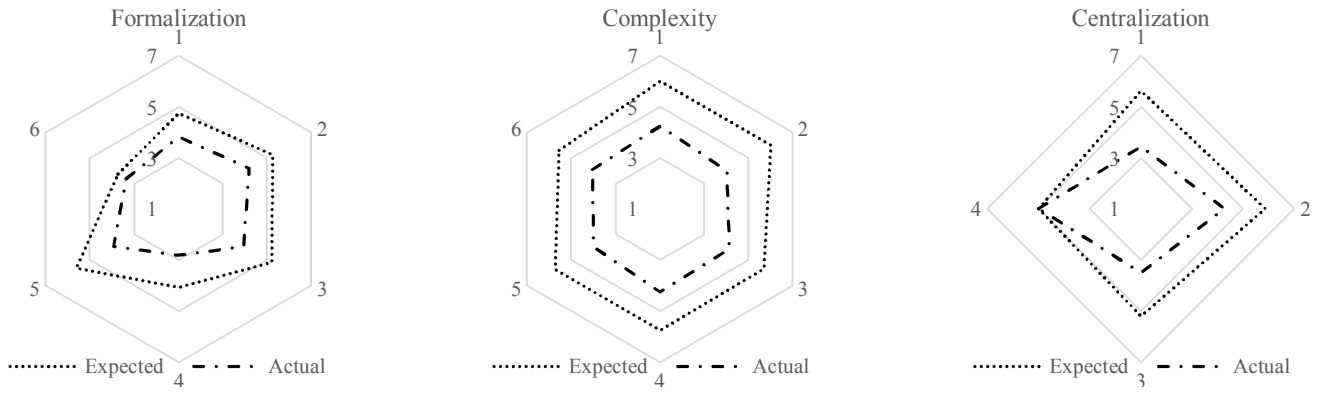

Fig. 8. Characteristic of a Company Sample (Overall - CO3)

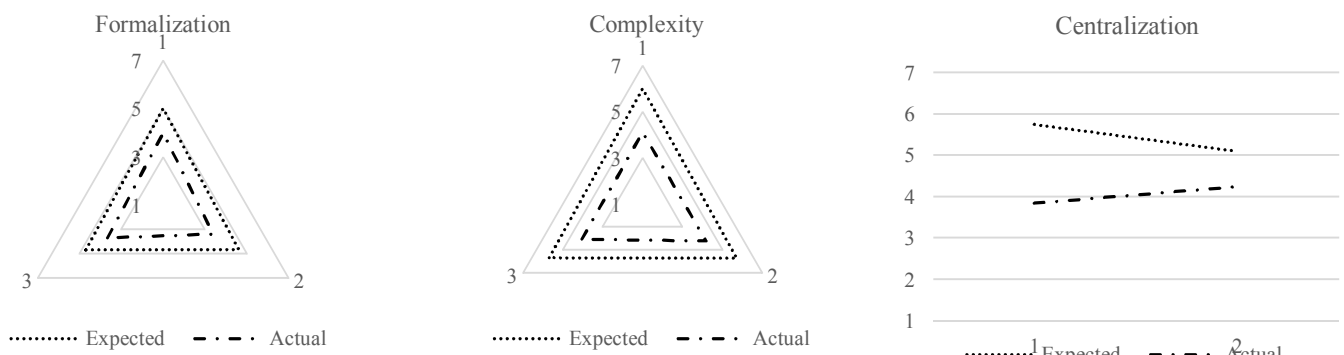

Fig. 9. Characteristic of a Company Sample (Average - CO3)

Although gap analysis had shown the difference between the nine construction companies that had responded, it was difficult to determine which organizational structure was, in fact, better or worse. Furthermore, due to the characteristic of the construction industry, the difference between each company was within 2-3 point range. As a result, further analysis on each factor was carried out.

The survey result for formalization is shown in Table 4. Each subcategory, as mentioned above, were composed of two questions (e.g. FT1 and FT2; FN1 and FN2; FS1 and FS2) in order to compare how consistent the surveyor answered. Also, each question (FT1, FT2, FN1, etc.) was asked to be answered twice (expected (E) value and actual (A) value) for gap analysis. Furthermore, the average values for the survey were first extracted from the given survey in order to determine the representative value for the survey. As the value is closer to 1, it represents that the organization is more formalized and alternately, the organization is less formalized as the value reaches closer to 7. The average value for the overall formalization factor appeared to be close to being neutral (4.00); some factors were shown to be more formalized whereas other factors were shown to be less formalized.

Table 4. Formalization Result

Formalization												
ID #	Threshold				New Ideas				Superior's Attitude			
	FT1		*FT2*		*FN1*		*FN2*		*FS1*		*FS2*	
	E	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*
Average												
CO1	5.18	4.46	4.91	4.82	5.46	5.00	4.36	3.55	5.64	4.55	3.73	3.64
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	4.75	3.81	5.25	4.19	5.19	3.94	4.06	2.81	5.63	3.94	3.75	3.38
CO4	4.68	3.95	5.11	4.95	6.11	4.84	4.63	3.16	5.90	4.63	3.68	3.74
CO5	5.28	4.06	5.78	5.33	5.11	5.00	4.22	4.28	4.89	4.89	3.94	4.00
CO6	5.77	3.86	5.46	4.68	5.41	4.32	4.41	3.32	5.32	4.32	3.91	4.09
CO7	4.58	3.32	5.53	4.84	5.79	4.26	4.68	3.58	5.95	4.68	3.47	3.74
CO8	4.00	3.42	5.17	4.58	5.67	4.83	3.25	3.00	5.17	4.58	3.92	3.67
CO9	-	-	-	-	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-	-	-	-	-
CO11	5.53	4.00	4.60	4.53	6.20	4.80	5.27	3.73	5.87	5.27	3.47	3.00
CO12	3.93	3.80	5.80	5.47	5.73	5.40	3.67	3.27	5.27	4.40	3.07	3.20
CO13	-	-	-	-	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

In order to determine if the survey response was reliable (independent), chi-square was calculated for the overall entry for each question. For chi-square value test, independence test between the expected and actual value of the responses for all the companies were carried out. From this step, chi-square value with less than 0.05 (critical point) was determined to be reliable; hence, the column with values more than the chi-square value threshold was

negated for further analysis as shown in Table 5. However, all the entry in formalization returned to be acceptable; therefore, no response was negated.

Table 5. Formalization Chi-Square Result

Formalization												
ID #	**Threshold**				**New Ideas**				**Superior's Attitude**			
	FT1		*FT2*		*FN1*		*FN2*		*FS1*		*FS2*	
	E	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*
Chi-Square												
df	25	25	25	25	25	25	25	25	25	25	25	25
%	0.0000		0.00021		0.00137		0.00000		0.00559		0.00000	
Average												
CO1	5.18	4.46	4.91	4.82	5.46	5.00	4.36	3.55	5.64	4.55	3.73	3.64
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	4.75	3.81	5.25	4.19	5.19	3.94	4.06	2.81	5.63	3.94	3.75	3.38
CO4	4.68	3.95	5.11	4.95	6.11	4.84	4.63	3.16	5.90	4.63	3.68	3.74
CO5	5.28	4.06	5.78	5.33	5.11	5.00	4.22	4.28	4.89	4.89	3.94	4.00
CO6	5.77	3.86	5.46	4.68	5.41	4.32	4.41	3.32	5.32	4.32	3.91	4.09
CO7	4.58	3.32	5.53	4.84	5.79	4.26	4.68	3.58	5.95	4.68	3.47	3.74
CO8	4.00	3.42	5.17	4.58	5.67	4.83	3.25	3.00	5.17	4.58	3.92	3.67
CO9	-	-	-	-	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-	-	-	-	-
CO11	5.53	4.00	4.60	4.53	6.20	4.80	5.27	3.73	5.87	5.27	3.47	3.00
CO12	3.93	3.80	5.80	5.47	5.73	5.40	3.67	3.27	5.27	4.40	3.07	3.20
CO13	-	-	-	-	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

Similar to the method used for formalization, results for complexity can be interpreted in the same method. As the response average is closer to 1, it

represents that the organization is more complex. Meanwhile, if the value is closer to 7, the organization is less complex.

As seen in Table 6, both expected and actual values for all of the companies were above average (4.00) which represents not only did all the employees for the nine companies wanted to be in a less complex organization, but they were in a less complex organization.

Table 6. Complexity Result

Complexity												
ID #	**Information Sharing**				**Job Description**				**Cooperation**			
	CI1		*CI2*		*CJ1*		*CJ2*		*CC1*		*CC2*	
	E	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*	*E*	*A*
Average												
CO1	5.64	5.27	6.36	5.64	5.82	5.00	5.82	5.27	5.09	4.91	5.46	5.18
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	6.00	4.25	6.00	4.00	5.69	4.13	5.75	4.25	5.75	4.00	5.56	4.06
CO4	5.74	5.53	5.68	5.32	5.37	5.32	5.58	4.68	5.21	4.16	5.16	4.53
CO5	5.78	5.44	5.83	5.39	5.44	5.17	4.89	4.83	5.33	4.94	5.78	5.50
CO6	5.64	5.05	5.59	4.96	5.36	4.73	5.50	4.86	5.27	4.23	5.41	4.73
CO7	6.00	4.68	5.84	4.32	5.58	4.95	6.00	4.84	5.58	4.74	5.95	4.95
CO8	5.67	4.92	5.50	4.67	5.67	4.67	6.00	5.50	5.08	4.42	5.58	5.25
CO9	-	-	-	-	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-	-	-	-	-
CO11	6.53	5.13	6.40	5.13	5.93	5.33	6.00	5.20	5.53	5.07	5.87	5.00
CO12	5.47	5.60	5.60	5.33	5.53	5.00	5.53	5.27	5.40	5.07	5.53	5.27
CO13	-	-	-	-	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

Equally, chi-square analysis was also done for complexity as seen in Table 7. On the other hand, chi-square value for question CJ2 was above 0.05, which resulted in negating the entry for the question.

Table 7. Complexity Chi-Square Result

Complexity												
ID #	**Information Sharing**				**Job Description**				**Cooperation**			
	CI1		*CI2*		*CJ1*		*CJ2*		*CC1*		*CC2*	
	E	*A*	*E*	*E*	*A*	*E*	*E*	*A*	*E*	*E*	*A*	*E*
Chi-Square												
df	25	25	25	25	25	25	25	25	25	25	25	25
%	0.00043		0.04131		0.02401		**0.11723**		0.00001		0.01469	
Average												
CO1	5.64	5.27	6.36	5.64	5.82	5.00	5.82	5.27	5.09	4.91	5.46	5.18
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	6.00	4.25	6.00	4.00	5.69	4.13	5.75	4.25	5.75	4.00	5.56	4.06
CO4	5.74	5.53	5.68	5.32	5.37	5.32	5.58	4.68	5.21	4.16	5.16	4.53
CO5	5.78	5.44	5.83	5.39	5.44	5.17	4.89	4.83	5.33	4.94	5.78	5.50
CO6	5.64	5.05	5.59	4.96	5.36	4.73	5.50	4.86	5.27	4.23	5.41	4.73
CO7	6.00	4.68	5.84	4.32	5.58	4.95	6.00	4.84	5.58	4.74	5.95	4.95
CO8	5.67	4.92	5.50	4.67	5.67	4.67	6.00	5.50	5.08	4.42	5.58	5.25
CO9	-	-	-	-	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-	-	-	-	-
CO11	6.53	5.13	6.40	5.13	5.93	5.33	6.00	5.20	5.53	5.07	5.87	5.00
CO12	5.47	5.60	5.60	5.33	5.53	5.00	5.53	5.27	5.40	5.07	5.53	5.27
CO13	-	-	-	-	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

Similar to formalization and complexity, the results for centralization can be interpreted in the same method. As the response average is closer to 1, it represents that the organization is more centralized. Meanwhile, if the value is closer to 7, the organization is less centralized. The average value for centralization resulted in above average of 4.000. This can be interpreted as the respondents believing and wanting the companies to be less controlling and allowing more decision making power for the employees. Chi-square analysis was also done for centralization as seen in Table 9. However, chi-square value for question CI2 was above 0.05, which resulted in negating the entry for the question.

Table 8. Centralization Result

Centralization								
ID #	**Decision Making**				**Superior's Power**			
	CD1		*CD2*		*CS1*		*CS2*	
	E	*A*	*E*	*A*	*E*	*A*	*E*	*A*
Average								
CO1	5.46	5.09	5.82	5.18	4.91	4.27	4.55	4.64
CO2	-	-	-	-	-	-	-	-
CO3	5.63	3.44	5.88	4.25	5.19	3.50	5.00	5.00
CO4	5.26	4.74	5.42	5.05	5.42	4.16	5.32	5.37
CO5	5.67	5.39	5.56	5.50	5.22	5.00	3.94	4.22
CO6	5.32	4.27	5.27	4.68	5.32	4.68	4.50	4.50
CO7	5.32	4.53	5.84	5.16	4.95	3.90	4.16	4.37
CO8	5.58	5.00	5.75	5.58	4.75	4.08	3.92	4.00
CO9	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-
CO11	6.00	4.67	5.80	5.40	5.53	4.27	4.67	4.93
CO12	4.87	4.87	5.33	5.27	4.67	4.47	4.47	4.40
CO13	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

Table 9. Centralization Chi-Square Result

Centralization								
ID #	**Decision Making**				**Superior's Power**			
	CD1		*CD2*		*CS1*		*CS2*	
	E	*A*	*E*	*E*	*A*	*E*	*E*	*A*
Chi-Square								
df	25	25	25	25	25	25	25	25
%	0.00004		**0.43003**		0.00404		0.00000	
Average								
CO1	5.46	5.09	5.82	5.18	4.91	4.27	4.55	4.64
CO2	-	-	-	-	-	-	-	-
CO3	5.63	3.44	5.88	4.25	5.19	3.50	5.00	5.00
CO4	5.26	4.74	5.42	5.05	5.42	4.16	5.32	5.37
CO5	5.67	5.39	5.56	5.50	5.22	5.00	3.94	4.22
CO6	5.32	4.27	5.27	4.68	5.32	4.68	4.50	4.50
CO7	5.32	4.53	5.84	5.16	4.95	3.90	4.16	4.37
CO8	5.58	5.00	5.75	5.58	4.75	4.08	3.92	4.00
CO9	-	-	-	-	-	-	-	-
CO10	-	-	-	-	-	-	-	-
CO11	6.00	4.67	5.80	5.40	5.53	4.27	4.67	4.93
CO12	4.87	4.87	5.33	5.27	4.67	4.47	4.47	4.40
CO13	-	-	-	-	-	-	-	-

(E = Expected Value; A = Actual Value)

4.3 Relationship of the Factors

After extracting the average value of the subcategories for each company, the values were standardized in order to show a more meaningful value. After, the subcategories were compared with the total value of orders (sum value of total value of orders from 2003 to 2013) as seen in Figure 10. To easily be able to differentiate the plot, the top firms were numbered (e.g. 1, 4, 5 and 12) whereas the lower firms have alphabets (e.g. CO3, CO6, CO7, CO8 and CO11) included in their label. Analyzing the graphs, two clusters can be distinguished in all of the graphs. Yet, not all the clusters give a definitive comparison between the two groups mentioned above. For example, graph F1 clearly differentiates the two types of companies. The top firms are on the right hand side of the graph meanwhile the other group is represented on the left hand side. In such case, the first factor in formalization (F1) clearly shows that there is a relationship between the two factors: F1 and total value of orders (performance). Graph F2, however, does show a decent cluster representing the two groups. Nonetheless, the groups overlap which reflects the two groups have a common area (e.g. similarities) resulting the graph to be inadequate for this research. Other graphs have shown similar trends where the two clusters overlap except graph Co1. Graph Co1, similar to graph F1, shows two types of clusters that is separated on both sides. Hence, through the analysis of the graph, graph F1 and graph Co1 appears to have a relationship with organizational performance.

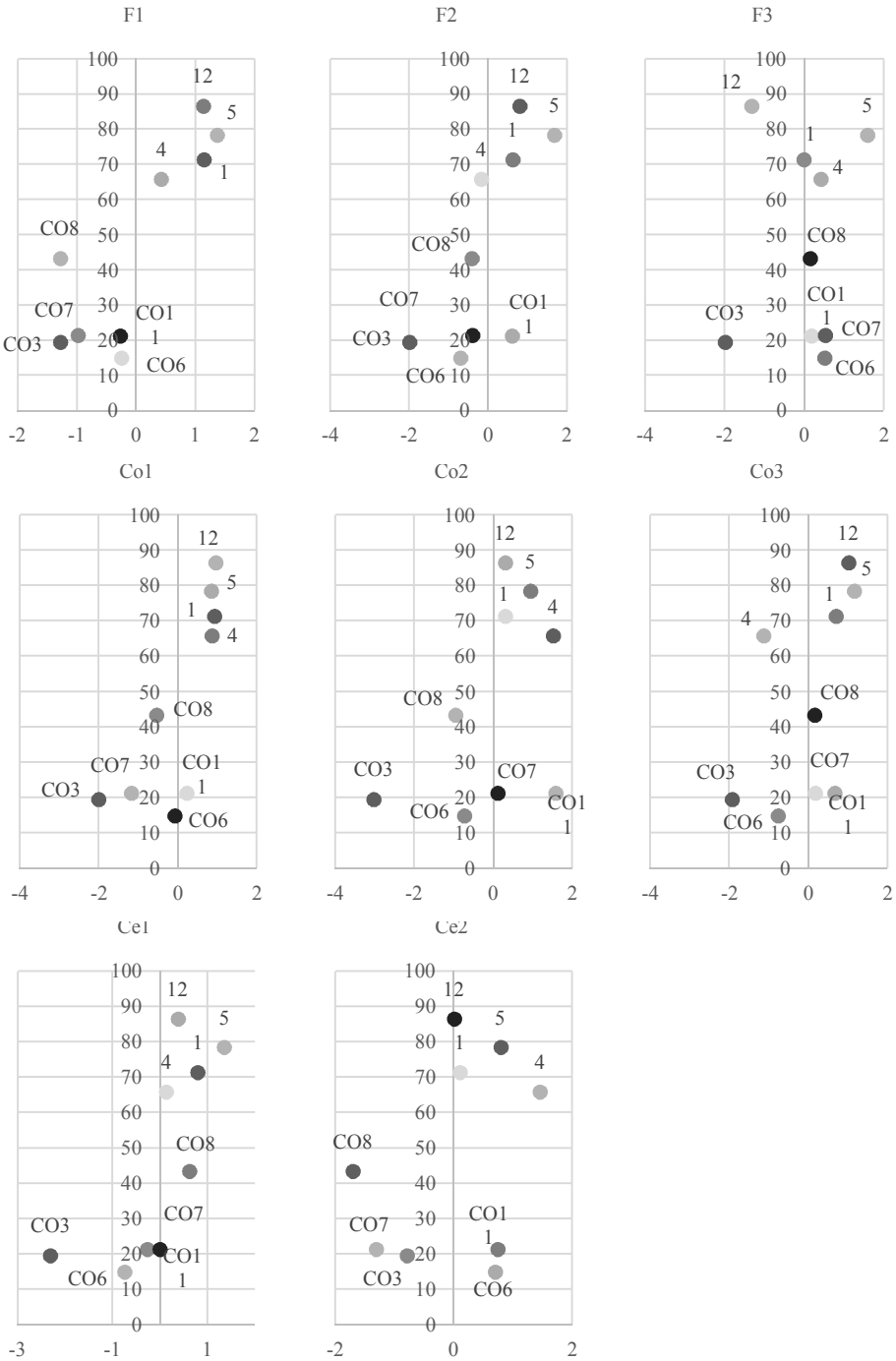

Fig. 10. Subcategories and Total Value of Order (billion USD)

4.5 Relationship of the Subcategories

To further analyze graph F1 and graph Co1, comparison analysis was carried out between formalization (three factors) and complexity (three factors) <Figure 11>, formalization (three factors) and centralization (two factors) <Figure 12>, and complexity (three factors) and centralization (two factors) <Figure 13>. However, of the 21 graphs representing the relationship between the subcategories, graph F1-Co1 in Figure 11 had shown a relationship that differentiates the two groups (advancing companies and slowly developing companies) that appeared after the 2008 financial crisis. To further investigate the relationship between the factors, the fit within the graph, R-square value, was calculated for graphs in Figure 11, Figure 12, and Figure 13.

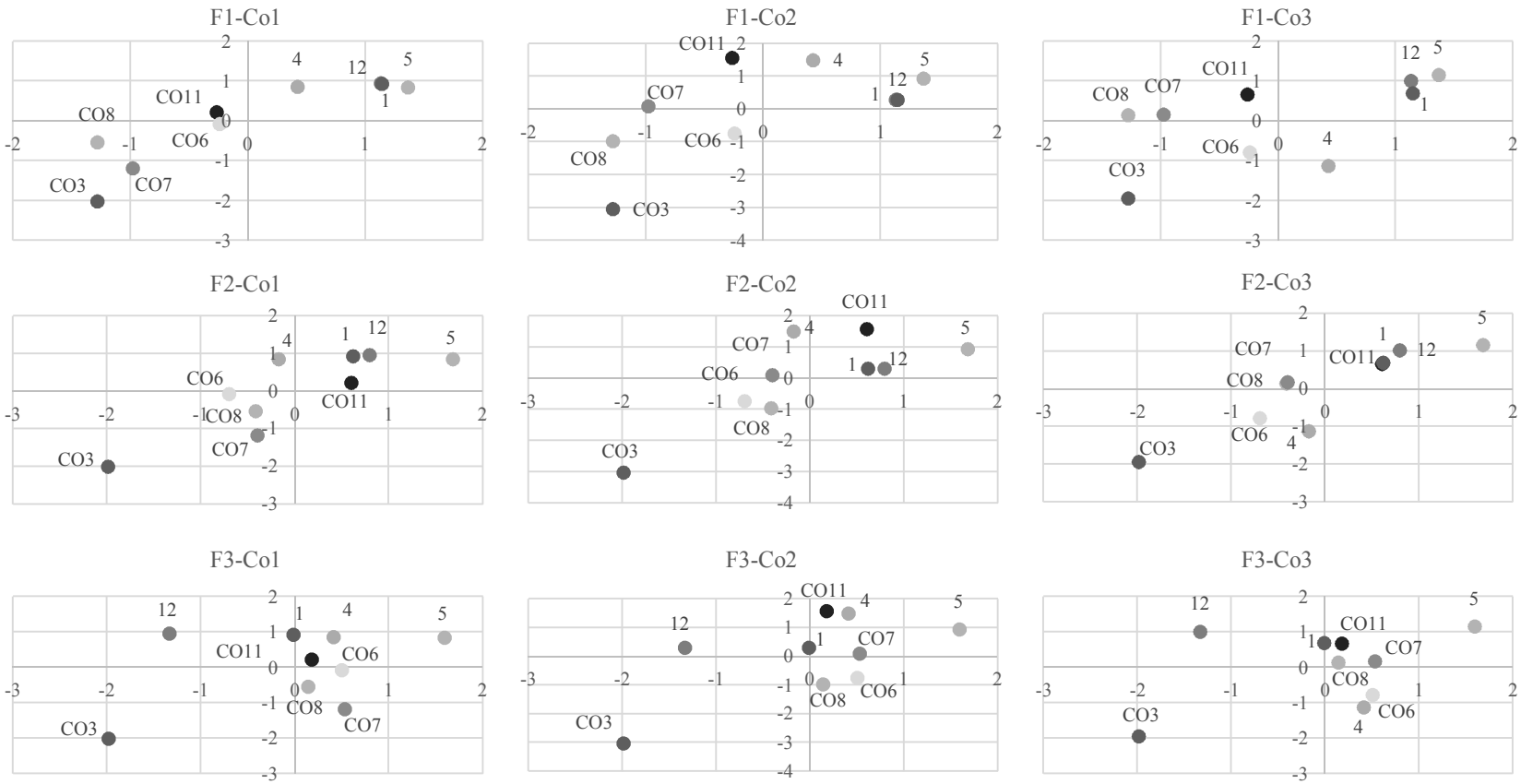

Fig 11. Formalization and Complexity

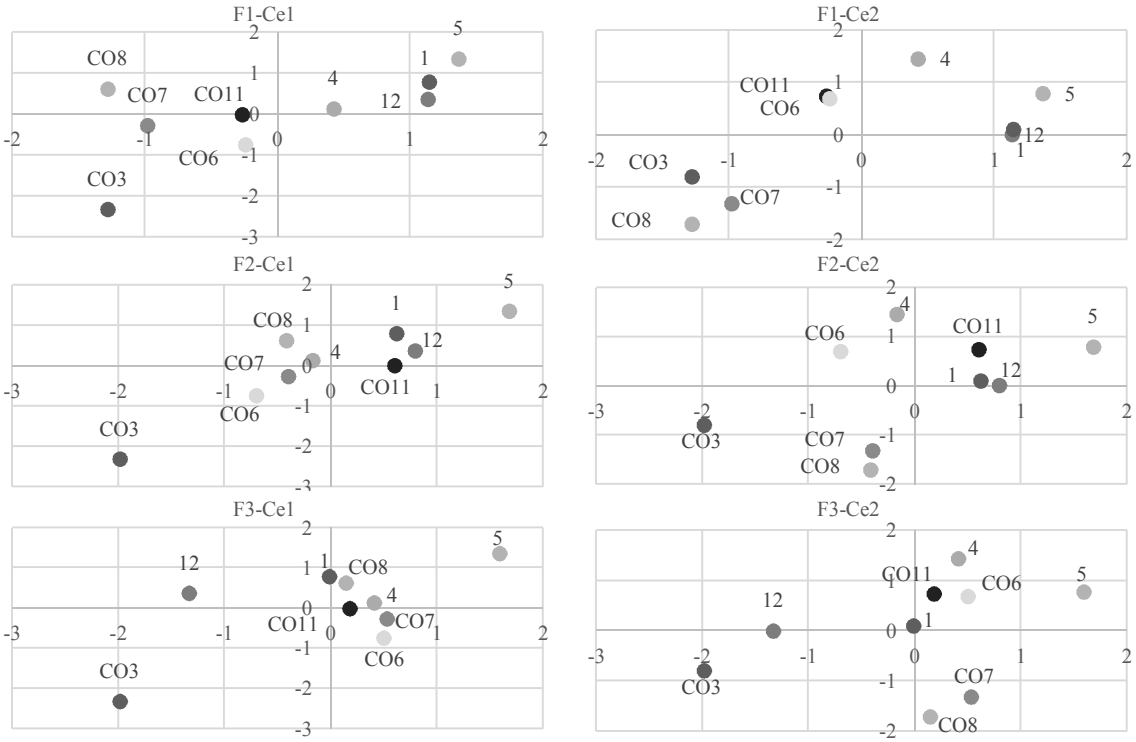

Fig. 12 Formalization and Centralization

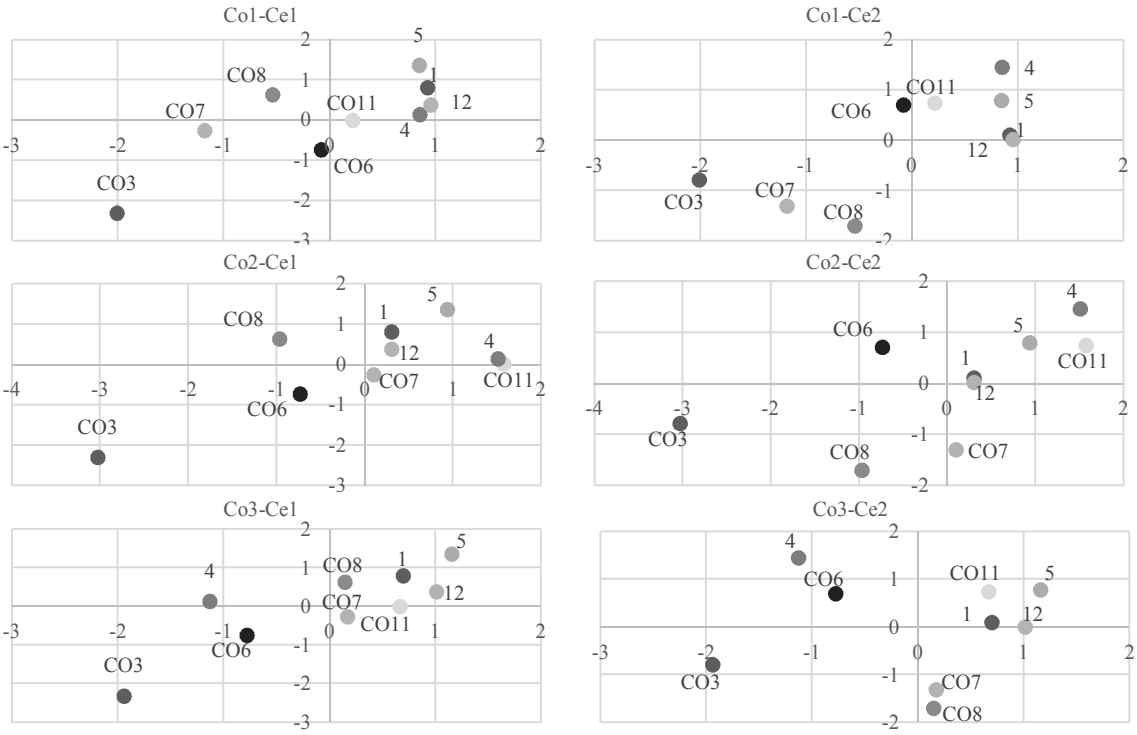

Fig. 13 Complexity and Centralization

4.6 Evaluating the Relationships

In order to determine if there was a fit within the graph, R-square value was calculated for the according graph as seen in Table 10. According to the R-square values, F1-Co1 and F2-Co3 were acceptable. F2-Co3, on the other hand, does not have consistency with the two groups (advancing companies and slowly developing companies) and therefore was chosen to be invalid for this research.

Table 10. R-Square Value

Factor	***Formalization and Complexity***								
Sub	F1-Co1	F1-Co2	F1-Co3	F2-Co1	F2-Co2	F2-Co3	F3-Co1	F3-Co2	F3-Co3
R^2	0.80	0.37	0.33	0.69	0.62	0.80	0.17	0.38	0.17
Factor	**Formalization and Centralization**								
Sub	F1-Ce1	F1-Ce2	F2-Ce1	F2-Ce2	F3-Ce1	F3-Ce2			
R^2	0.42	0.43	0.79	0.19	0.43	0.11			
Factor	**Complexity and Centralization**								
Sub	Co1-Ce1	Co1-Ce2	Co2-Ce1	Co2-Ce2	Co3-Ce1	Co2-Ce2			
R^2	0.61	0.47	0.52	0.38	0.69	0.00			

4.7 Summary

After analyzing the survey results through gap and comparison analysis, this research suggests that there are two subcategories, threshold (formalization) and information sharing (complexity), which have a relationship with organizational performance. Furthermore, the relationship between the two subcategories were also found through the analysis. The graph for the subcategories of the organization structure showed a positive trend in this research: the more open and sharing a company tends to be the have a higher financial profit. On the other hand, other subcategories did not show significant relationship with one another or with organizational performance.

Chapter 5. Conclusion

5.1 Result and Discussion

This research had extracted factors concerning organizational structure (e.g. formalization, centralization and complexity), organizational performance (financial) and environment (financial crisis of 2008). Although it is not possible to include all the factors as the relationship between the three categories (environment, organizational structure and organizational performance) are too complex, the most significant factors were chosen that would represent the best within this research. As a result, the study may not reflect a precise outcome had it included other factors.

A survey was conducted to determine the characteristics of a certain construction organization in order to create a relationship among the environment, organizational structure and organizational performance. Each organization had differing characteristics which led to varying organizational performance. As the environment was viewed as a constant variable in this research considering all the construction firms had to undergo the equivalent financial burden during the 2008 recession, the environment was not taken into much consideration as a factor but rather an event that was shared among other companies.

After the survey analysis, of the eight subcategories that were extracted

from the three organizational structure factors (formalization, complexity, and centralization), two pairs of subcategories appeared to have a relation to organizational performance (F1 (formalization - threshold) - Co1 (complexity - information sharing) and F2 (formalization - new ideas) - Co3 (complexity - cooperation)). Nevertheless, although both pairs returned to have R-square value of 0.80, only one of the pair was valid. F2-Co3 was negated as discrepancies among the companies (advancing companies and slowly developing companies) existed in the graph. As for the other pair, the result can be interpreted as an organization with more freedom of choice (threshold) and more knowledge sharing (information sharing), the higher performance appeared to be. Such conclusion, however, cannot be said that organizational performance is limited to the two subcategories mentioned above as performance is more than complex. Furthermore, other six factors (new ideas, superior's attitude, job description, cooperation, decision making, and superior's power) did not show much relation to the performance of the Korean construction companies.

5.2 Further Study & Contribution

As a result of this research, the limitations of the study and future studies have been identified. They include the following:

1) Survey conducted involved not the majority of the firm but rather just an acceptable number of participant. In order to increase the accuracy of this research, involving more participants (both firms and survey participants) would be beneficial.
2) Subcategories that were extracted from the factors of organization may not include all the factors. As a result, the survey responses are only limited to this research scope.
3) The type of performance selected for this research is only a part of the actual *performance* of a firm. It does not necessarily represent how successful a firm is. The future study may involve various types of performance in order to determine a more accurate result.

Since this study was able to define factors that have an effect on the organizational performance, this study may be beneficial to those companies that trying to enhance their performance. Hence, through this study, construction organizations will be able to a) understand how performance differs according to the organizational structure and b) determine which sector (factor) of the organizational structure needs to change that may encourage better performance.

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국 문 초 록

건설 산업은 급속히 변화하는 환경(경제적, 재무적 등)으로 인해 영향을 받아왔다. 환경의 변화로 인해 조직성과도 변화를 하게 되었는데, 이는 기업의 긍정적인 영향(성장, 이익 등) 혹은 부정적인 영향(구조적 변화, 기업축소 등)을 미치며, 조직구조는 간접적인 매개체로써 환경변화와 기업성과의 연결고리가 된다. 그러므로 본 연구는 건설기업의 조직구조의 특성에 대하여 파악하고, 조직구조가 기업성과에 미치는 영향에 대하여 분석을 수행하였다. 이를 위하여 2008년 글로벌 경제위기 시점의 9개 건설기업의 조직구조를 분석하였다.

조직구조와 외부환경의 관계를 살펴보기 위해, 선행연구를 통해 조직구조의 주요소(형식화, 복잡성, 집권화)를 추출하고, 주요소는 다시 세부적인 요소(한계점, 새로운 아이디어, 상사의 태도, 정보공유, 직무해설서, 협력, 의사결정, 상사의 권력)로 세분화했다. 그런 다음, 세부요소를 응용하여 설문지를 작성하고 국내 건설기업에 배포했다. 회수된 설문지를 응용하고, 갭분석 (gap analysis)을 실행하여 기업의 성향을 알아보고 비교분석을 통해 세부적인 요소(조직구조)와 기업성과의 관계를 알아보았다.

본 연구의 결과, 조직구조와 기업성과는 상관관계가 있는 것으로 분석되었다. 즉, 조직구조가 1) 자율성과 정보공유가 높을수록 조직성과는 우수하다는 결과가 도출되었으며, 2) 반대로 자율성과 정보공유가 낮을수록 조직성과는 저조한 것으로 나타났다. 본 연구는 국내 건설기업의 조직과 기업성과의 관계에 대하여 분석한 연구로서, 글로벌 경제위기와 같은 부정적인 상황에서 기업성과를 향상시키기 위해서는 조직구조를 살펴볼 필요성이 있다는 것을 보여준다.

주요어: 건설산업, 조직구조, 조직성과, 외부환경

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