Regression Model of the Effect of Management Environment on the Contract Amount of Construction Firms

Hye-Sung Park¹, Donghoon Lee¹ and Sunkuk Kim*²

¹Ph.D. Candidate, Department of Architectural Engineering, Kyung-Hee University, Korea
²Professor, Department of Architectural Engineering, Kyung-Hee University, Korea

Abstract
The growth potential of a corporation can be assessed in terms of its orders and sales. Because the management of a construction company starts with order-taking, orders received is directly related to corporate survival. New orders are impacted not only by construction business cycle, but also by a variety of external factors such as loan interest rate, legislation, and orders awarded in the public and private sectors, among other factors. These environmental factors have different impacts on companies and it is not easy to establish these relationships. However, it is possible to establish the impacts that particular environmental factors such as orders available from the public and private sectors have on orders received by companies in relative and qualitative terms, though it is still necessary to quantify such impacts. Nevertheless, no preceding research has attempted to quantitatively analyze the relationship between environmental changes and management performance of construction firms in Korea. Hence, the objective of this paper is to propose a regression model of the effect of management environment on contract amount of construction firms. The outcomes of this study will help forecast management performance in response to changes in business environment and provide basic inputs for corporate management strategies.

Keywords: business environment; management performance; contract amount; quantitative analysis; regression model

1. Introduction
Changes to the external environment in the construction industry have a huge influence on corporate performance (Lee et al. 2009). To forecast and analyze the management environment, a great amount of data and logical procedures are needed. Quantitative analysis of the management environment for every management unit period requires abundant resources, and there are often insufficient data or analysis errors. These problems can be addressed by establishing and evaluating logical models. A logical model consists of two steps. The first step is to forecast future changes based on the characteristics of long-accumulated time-serial data and recent trends. The second step is to analyze the relationship between changes to management environment and management performance. If changes to the management environment are forecasted accurately and their relationship to management performance is verified, it is possible for construction companies to establish reasonable management plans. However, because few prior studies have constructed logical models, it is hard for construction companies to develop a reasonable and quantitative management plan. Especially in developing countries, it is difficult to solve the problem due to a common lack of experience (El-Dash 2007). Numerous studies have confirmed that corporate performance is closely related to management strategy (Moores and Yuen 2001, Niven 2002, Kaplan and Norton 1996). Therefore, the relationships between changes to the management environment and performance have to be analyzed to establish a management plan and strategy for construction companies.

The most basic indicator related to the survival of construction companies is growth potential. The growth potential of a corporation can be assessed in terms of its contract amount and sales. Because management of a construction company starts with projects awarded, contract amount is directly related to corporate survival. New contract amounts are impacted not only by construction business cycle, but also by a variety of external factors such as loan interest rate, legislation, and orders awarded in the public sector, among others. These environmental factors have different impacts on companies and it is not easy to establish these relationships. However, it is possible to establish the impacts that particular environmental factors, such as
orders in the public sector, have on the contract amount of companies in relative and qualitative terms, but it is still necessary to quantify such impacts. Hence, the objective of this paper is to propose a regression model of the effect of management environment on contract amount of construction firms.

This paper includes large-sized Korean construction firms, for analysis, that carry out the construction of buildings, infrastructures and plants in both domestic and overseas markets. This paper focuses on contract amount to assess management performance. The analysis comprises the following four steps:

1) Conducting a survey of corporate management experts to identify management environmental factors affecting contract amount.
2) Collecting time-serial data of management environmental factors.
3) Gathering 30-year performance data of listed Korean companies ranked in the top 20 in terms of construction capability assessment.
4) Analyzing the relationship between the changes to management environment and contract amount.

2. Literature Survey

The primary hypothesis of this study is that analysis of changes in construction environment can forecast corporate performance. This hypothesis has been confirmed by previous studies. Kwon et al. confirmed that a competitive strategy is closely related to management environment (Kwon et al. 1999). This is especially the case in construction firms. The management environment affecting the construction industry includes changes in economy, finance, technology, policies, and legislation. Moreover, the impacts of these factors on corporate performance vary relative to one another. Lee and colleagues (2009) analyzed the correlation between changes to management environment and corporate performance of construction companies. Their analysis confirmed that price changes of materials, such as raw materials and intermediate goods, were negatively related to the average debt ratio of construction firms, and that a rise in corporate loan interest rates also increased the average debt ratio (Lee et al. 2009).

To study corporate management performance, a method to measure financial performance such as current net income, return on investment, and return on equity was developed by Ittner and Larcker (1998). Another study also proposed a method to measure quantitative and financial performance to evaluate whether the profit target is attained or not along with an increase in sales (Lee and Pyo 1996). However, the transition into an information-oriented society since the 1990s has made intellectual property issues, which underlie corporate management efficiency, increasingly important, and a prior study therefore evaluated the retention of intellectual properties by companies and the effect of this on their performance (Kaplan et al. 1996). Park et al. (2010) analyzed strategic planning in construction firms. They focused on how global firms with revenue similar to that of Korean firms in 1995 have changed their business structure (Park et al. 2010). And there was a study about risk management in the construction phase of building projects, the purpose of which was to clarify the risk mechanism and the realities of risk management (Tsai and Yang 2009, Kim et al. 2005, Tsai et al. 2002, Cha and Shin 2011).

Based on the theories drawn from preceding studies, the authors analyzed the performance of businesses by identifying the correlation between changes in management environment and corporate performance. The authors first performed a survey of experts to determine factors affecting business performance so as to limit the scope of analysis.

3. Identification of Influence Factors

Changes to the external environment refer to changes that affect the set-up of management goals. The survey was carried out to examine factors that influence management goals based on the opinions of management experts. Two surveys were conducted to identify all external environmental factors that affect corporate performance. Experts participated in these surveys included CEOs, top managing directors and those in charge of or supporting management tasks.

As shown in Table 1., 25 experts participated in both surveys; these experts comprised four top managing directors and CEOs, 15 department managers or managing directors, and six project managers. Of these respondents, eight participated in corporate management, 12 were involved in the decision-making process, and five participated in the analysis and support of management. Because this study covered the management activities of strategic business units as well as enterprise management, those who participated in the management of individual business units were included as well. Moreover, those supporting management were also included because they were responsible for analyzing changes to the management environment and analyzing various data for decision-making by management.

| Position in company                  |                      |
|-------------------------------------|----------------------|
| Top managing directors including CEOs | 4 (16%)              |
| Managing directors                  | 15 (60%)             |
| Project managers                    | 6 (24%)              |
| Management role in the company      |                      |
| Participation in corporate management | 8 (32%)             |
| Participation in strategic business unit management | 12 (48%) |
| Participation in project management | 5 (20%)              |

As stated above, the survey was conducted twice. The first survey produced a total of 16 quantitative evaluation items and excluded factors not seriously
affecting the growth of a corporation, as well as those that were co-dependent such as 'trends in the housing market' 'economic democracy', and 'strengthening fair trade.' Respondents were informed of the outcomes of the first survey, and then the second survey was implemented. The results are summarized into 11 items that are shown in Table 2.

In these surveys, environmental factors affecting corporations were summarized as 'trends of contract amount and sales', 'orders in the public sector', and 'changes in laws and regulations'. This study investigates corporate-level factors, but excludes qualitative factors such as changes in laws or regulations due to the difficulty in quantifying these factors.

Table 2. Factors Affecting Management Performance

| Division      | Factors                                      |
|---------------|----------------------------------------------|
| Corporate level | Trends of contract amount and sales in domestic and overseas markets |
|               | Orders in the public sector                  |
|               | Changes in laws and regulations              |
| Building division | Fluctuation of building contracts and sales |
|                | Fluctuation of overseas building contracts and sales |
| Housing division | Fluctuation of domestic housing contracts |
|                | Fluctuation of corporate loan interest rate |
|                | Number of unsold houses/Housing supply rate |
|                | Changes in laws and regulations related to real estate |
| Civil division | Trends of contract amount and sales in domestic civil market |
|                | Trends of contract amount and sales in overseas civil market |

4. Relationship Analysis between Management Environment and Contract Amount

Fluctuations in the construction market and the amount of orders affect corporate performance. However, it is hard to quantitatively assess the impacts of such changes to the external environment on corporate performance. For instance, even though the construction market is predicted to grow by 5% next year, it is hard to identify how much this should be reflected in a company's management goals. To this end, it is necessary to perform a quantitative analysis of the relationship between 5% market growth and corporate performance. The authors therefore analyzed how corporate external environmental factors such as 'the amount of domestic private orders', 'the amount of domestic public orders', and 'the contract amount of overseas orders' impact management performance using correlation analysis. In this paper, 'the contract amount of overseas orders' refers to the total contract amount of Korean construction firms in overseas market.

These data were collected from the Korea Institute of Construction Technology (KICT), Bank of Korea, International Contractors Association of Korea (ICAK), and Korea Listed Companies Association. Table 3 shows the descriptive statistics of collected data.

Table 3. Descriptive Statistics of Collected Data

|                        | N  | Min.  | Max.  | Mean  | Std. Deviation |
|------------------------|----|-------|-------|-------|----------------|
| Amount of domestic private orders | 11 | 33454 | 94477 | 67434 | 20509.3 |
| Amount of domestic public orders | 11 | 14808 | 29167 | 20526.2 | 5056.4 |
| Contract amount of overseas orders | 11 | 2942 | 71579 | 27712.5 | 25785.7 |
| Contract amount of Group A | 11 | 5183 | 9816 | 7745.3 | 1657.9 |
| Contract amount of Group B | 11 | 836  | 2262 | 1428.9 | 479.7 |

Most companies in the domestic construction industry have annual contract amount of 1–3 billion USD; these companies are clearly different from those with annual contract amounts of more than 3 billion USD. The companies with annual contract amount in excess of 3 billion USD have their own exclusive information, technology and business spread (Son 2014). For this reason, as shown in Table 3, the authors divided companies into two groups: Group A, comprising companies with annual contract amounts of over 3 billion USD, and Group B, comprising companies with contract amounts over 1 billion USD, both as of 2013. According to the data analysis, it is confirmed that two groups in different corporate size and competitiveness show different responding power to environment changes.

Fig.1. shows the scatter diagram of fluctuations in contract amount according to changes in the external environment for both groups. The amount of domestic private orders and Group A's contract amount had a typical quantitative correlation, as shown in Fig.1. (a). The amount of domestic public orders in Fig.1. (b) and the amount of overseas orders in Fig.1. (c), however, had no such quantitative correlations with Group B's contract amount.

Fig.1. (d) shows the scatter diagram of the amount of domestic public orders and Group B's orders received; there was no quantitative correlation with Group B's orders received.

The amount of domestic public orders as well as other external environmental factors such as the amount of domestic private orders and the contract amount of overseas orders had no correlation with Group B's orders received.

Data used to analyze the correlations include 12-year changes in environmental factors and the average orders received by Group A and Group B.
The correlation of Group A with environmental changes was very high, while that of Group B was insignificant. The difference in results for Group A versus Group B is caused by trends in growth potential. Group A was sensitive to environmental changes, such as growth and reduction of orders. However, Group B showed no response to environmental changes and its overall growth potential was weak. These results demonstrate that Group A was sensitive to environmental changes and its business area was evenly spread across the overall construction industry, resulting in a constant response to various environmental changes.

These results indicate that Group A, which has a varied business area including buildings, infrastructures and plants in both domestic and overseas markets, responds actively to environmental changes, whereas Group B, which has a limited business area, lacks the information and technological capability to respond to these changes. Fig.1 verifies that an increase of orders in various markets has positive effects on Group A, but not on Group B.

The authors therefore analyzed the relationship between management environment and corporate performance using changes in companies. Comparisons were made using the amount of domestic private orders, the amount of domestic public orders, and the contract amount of overseas orders as independent variables. A huge difference in correlations of Group A versus those of Group B for independent variables was found, as shown in Fig.1.

In contrast, Group B can be considered as no correlations for the three independent variables as shown in Table 4. Group B had correlations under 0.315 for each independent variable.

Group A had a correlation of 0.823 or above for each independent variable. As shown in Table 5, the Pearson correlation coefficient of the amount of domestic private orders and Group A was 0.928, which indicates a close connection. Here, the correlation coefficient was significant at the 0.01 level on the two-tailed test. The amount of domestic public orders was also highly related to the orders received by Group A. These two indicators showed a positive correlation with a Pearson correlation coefficient of 0.823 as shown in Table 6., which indicates a close relationship, as seen for the amount of domestic public orders. However, the correlation coefficient of the amount of domestic public orders was relatively lower than that of the amount of domestic private orders due to the small absolute quantity.

The last external environmental factor analyzed for Group A was the contract amount of overseas orders. As shown in Table 7., the contract amount of overseas orders had a high correlation coefficient value of 0.871. The correlation coefficient was significant at the 0.01 level on the two-tailed test. These results indicate that Group A is highly influenced by the three factors of the amount of domestic private orders, the amount of domestic public orders, and the contract amount of overseas orders. The contract amount of overseas orders has a huge influence on domestic construction companies, and must be evaluated to forecast a company's growth potential.
To quantitatively forecast corporate performance based on changes to the external environment, the authors performed regression analysis of each factor. The linear regression analysis results are shown in Tables 8. and 9. Regression analysis of the amount of domestic private orders and Group A had a R-square value of 0.862 and an estimated standard error value of 649.27. Analysis of variance (ANOVA) of this function gave a sum of squares of $2.37 \times 10^7$ and a probability of 0.0, which is significant.

To quantitatively forecast corporate performance based on changes to the external environment, the authors performed regression analysis of each factor. The linear regression analysis results are shown in Tables 8. and 9. Regression analysis of the amount of domestic private orders and Group A had a R-square value of 0.862 and an estimated standard error value of 649.27. Analysis of variance (ANOVA) of this function gave a sum of squares of $2.37 \times 10^7$ and a probability of 0.0, which is significant.

Table 8. Summary of Regression Model for Domestic Private Orders

| R     | R square | Standard error |
|-------|----------|----------------|
| 0.928 | 0.862    | 649.27         |

Table 9. ANOVA of Domestic Private Orders

|                      | Sum of Squares | df | Mean Square | F       | Sig. |
|----------------------|----------------|----|-------------|---------|------|
| Regression           | $2.37 \times 10^7$ | 1  | $2.37 \times 10^7$ | 56.2    | 0.0  |
| Residual             | $3.79 \times 10^6$ | 9  | $4.22 \times 10^5$ |         |      |
| Total                | $2.75 \times 10^7$ | 10 |             |         |      |

The results of regression analysis of the amount of domestic private orders and Group A are shown in Table 10. Models applied included second-order, third-order, combination, power, S, growth, indicator, and logistic models. Six models with a R-square value of 0.864 had similar shapes as shown in Fig.2.; it was difficult to identify differences in results within the scope of analysis, as most models were in the form of a linear function. Although the linear model had a lower R-square value than the other model types, the authors concluded that a linear function was the most suitable model to minimize the distortion of shape and errors when analyzing relationships.

Table 10. Summary of Regression Model for Domestic Public Orders

| R     | R square | Standard error |
|-------|----------|----------------|
| 0.823 | 0.677    | 992.79         |

Models applied to regression analysis of the amount of domestic public orders and Group A included second-order, third-order, combination, power, S, growth, indicator, and logistic models. The second-order and third-order models showed the most significant fits each with a R-square value of 0.779.

Table 11. shows the results of linear regression analysis of the amount of overseas orders and Group A. Regression analysis of the contract amount of overseas orders and Group A had a R-square value of 0.871 and an estimated standard error value of 860.105. ANOVA of this function yielded a sum of squares value of $2.75 \times 10^7$ for 10 degrees of freedom and a probability of 0.0, which is significant.

Table 11. Summary of Regression Model between Total Contract Amount of Group A and Total Overseas Contract Amount of Korean Firms

| R     | R square | Standard error |
|-------|----------|----------------|
| 0.871 | 0.758    | 860.11         |

Fig.3. is a regular P-P diagram for the regression model of the contract amount of overseas orders and Group A's contract amount. Observed cumulative probability and expected cumulative probability displayed a near-linear shape. Because the dots on the PP diagram of regular probability, which is the standardized residual, are placed on a straight line at 45 degrees, regularity is satisfied.

Models applied to regression analysis of the contract amount of overseas orders and Group A were second-order, third-order, combination, power, S, growth, indicator, and logistic models as shown in Fig.4. The best-fit models were the second-order model and the second-order model with R-square values of 0.935 and 0.894, respectively. Note that these R-square values are higher than that of the primary function model value. However, the contract amount of overseas orders and Group A had a strong correlation. Examination of the characteristics of data and the shapes of the second and third-order models indicate that analysis should
be performed by applying the primary function model even though it had a slightly lower R-square value than the second and third order models.

As mentioned above, the primary hypothesis of this study is that analysis of changes in construction environment can forecast corporate performance. According to this hypothesis, the expected amount of domestic private and public orders, including overseas orders for the next year, can be forecast based on past time-serial data. Regression models $Y_1$, $Y_2$, and $Y_3$, can be drawn up by using the expected amount of orders as the independent variables. Regression equations established from each model from Equations (1) to (3) are as follows. The R-square values and P-values are stated at the end of the equations.

1) Expected contract amount of Group A in the domestic private sector

$$Y_1 = 2864.29 + 0.075X_1$$

(R$^2$: 0.847; P: 0.000) (1)

Here,

$Y_1$: Expected contract amount of Group A in the domestic private sector

$X_1$: Expected amount of domestic private orders based on the past time-serial data

R$^2$: R-squared

P-value: Probability

2) Expected contract amount of Group A in the domestic public sector

$$Y_2 = 2206.51 + 0.27X_2$$

(R$^2$: 0.677; P: 0.002) (2)

Here,

$Y_2$: Expected contract amount of Group A in the domestic public sector

$X_2$: Expected amount of domestic public orders based on the past time-serial data

3) Expected overseas contract amount of Group A

$$Y_3 = 6194.21 + 0.056X_3$$

(R$^2$: 0.758; P: 0.000) (3)

Here,

$Y_3$: Expected overseas contract amount of Group A

$X_3$: Expected overseas contract amount based on the past time-serial data

The total contract amount of Group A can be forecast by external environmental changes with $X_1$, $X_2$, and $X_3$. Equation (4) is the result of multiple regression analysis using the amount of domestic private orders, the amount of domestic public orders, and the contract amount of overseas orders as independent variables. The multiple regression model had a R-square value of 0.916 as shown in Table 12.

4) Expected total contract amount of Group A based on external environmental changes

$$Y_4 = 4273.36 + 0.55X_1 - 0.54X_2 + 0.31X_3$$

(R$^2$: 0.916; P: 0.000) (4)

Here,

$Y_4$: Expected total contract amount of Group A based on external environmental changes ($X_1$, $X_2$, $X_3$)

Table 12. Summary of Multiple Regression Analysis

|   | R     | R square | Standard error |
|---|-------|----------|----------------|
|---|-------|----------|----------------|
|   | 0.957 | 0.916    | 575.18         |

Meanwhile, the expected probability values were not exactly the same in the regular P-P diagram of standardized residuals for the multiple regression model, as shown in Fig.5., but they were not far off the normal distribution.

To test the goodness-of-fit of the regression model established in this study besides R-square values, the time-serial values of external environmental changes such as domestic private orders, domestic public orders, and overseas orders from 2001 to 2011 were
first estimated to forecast the total contract amount of Group A. Application of such environmental changes to equation (4) resulted in estimation errors of 1.8% (minimum), 17.1% (maximum) and 5.3% (average) after comparing the actual data with estimates based on the equation (4). These test results indicate that the regression model suggested in this study is reasonably applicable to forecast the total contract amount of Group A. And the estimation errors would be reduced by collecting and analyzing data over a longer period of time.

5. Conclusions

Orders received by construction companies are affected by various external factors such as loan interest rate, legislation, and orders awarded in the public sector. These environmental factors have different impacts on companies and it is not easy to establish what these impacts are. In this study, the authors analyzed the relationship between changes to environmental factors affecting construction companies and orders received to quantify the impacts of changes to management environment on contract amount. The authors' findings can be summarized as follows:

1) Two surveys of 25 management experts resulted in identification of 11 external factors affecting orders received by construction companies, including 'changes in construction orders and contracts' and 'budget for public orders'.

2) Large construction companies with annual sales of over 3 billion USD were sensitive to changes to the management environment. Correlation analysis revealed that these companies were very responsive to order-related changes to the external environment, including the size of the market. By analyzing correlations with corporate performance, we obtained correlation coefficients of 0.928, 0.823, and 0.871 for the amount of domestic private orders, amount of domestic public orders, and contract amount of overseas orders, respectively.

3) Group A had a correlation of 0.823 or above for each independent variable. In contrast, Group B that had correlations under 0.315 for the three independent variables can be considered as no correlations for each independent variable.

These results mean that Group A with the variety of business area such as the projects of buildings, infrastructures and plants in both domestic and overseas markets responds actively to environment changes, whereas Group B with limited business area lacks the information and technological capability responding to environmental changes. As a result, the analysis verifies that the increase of orders in the markets has positive effects on Group A rather than Group B.

4) Correlations between external environmental factors affecting construction companies and orders received were analyzed to establish regression equations. R-square value of the correlation between the amount of domestic private orders and orders received was 0.847, while that of the correlation between the amount of domestic public orders and orders received was 0.779. Furthermore, the R-square value of the correlation between the contract amount of overseas orders and orders received was 0.758. The residuals were insignificant. Simple regression analysis and multiple regression analysis were performed; the authors had higher confidence in the results of simple regression analysis considering the characteristics of the data.

In this study, time-serial data of changes to environmental factors were collected, cross-relations were analyzed, and regression equations were established. Outcomes from this study will help forecast corporate performance in connection with changes to the corporate environment and serve as basic inputs for efforts to develop corporate management strategies.

Acknowledgements

This work was supported by a grant from the National Research Foundation of Korea (NRF) funded by the Korea government (MSIP) (No. 2013R1A2A2A01068297).

References

1) Lee, D.H., Kim, S.K., Shin, D.H. (2009) A Correlation Analysis between the Change of Managerial Environment and the Business Performance of Domestic Construction Firms. Journal of the Korea Institute of Building Construction, 9(1), pp.111-121.

2) El–Dash, K. (2007) Assessing Human Resource Management in Construction Projects in Kuwait. Journal of Asian Architecture and Building Engineering, 6(1), pp.65-71.

3) Moores, K. and Yuen, S. (2001) Management Accounting Systems and Organizational Configuration: a Life-cycle Perspective. Accounting, Organizations and Society, 26(4), pp.351-389.

4) Niven, P.R. (2002) Balanced scorecard step-by-step. New York, John Wiley & Sons.

5) Kaplan, R.S. and Norton, D.P. (1996) Using the Balanced Scorecard as a Strategic Management System. Harvard business review, 74(1), pp.75-85.
6) Kwon, K.H., Kim, B.S., Kim, Y.J., and Lim, S.J. (1999) Relationship among Environment, Competitive Strategy and Organizational Structure: Performance Implication. Journal of Korea Strategic Management Society Information, 2(2), pp.41-73.

7) Ittner, C.D. and Larcker, D.F. (1998) Innovations in performance measurement: Trends and research implications. Journal of Management Accounting Research, pp.205-238.

8) Lee, K.Y. and Pyo, J.H. (1996) Strategic Performance Evaluation System. Seoul, 21st Century Books.

9) Kaplan, R.S., Norton, D.P., and Horváth, P. (1996) The balanced scorecard. Vol. 6. Boston, Harvard Business School Press.

10) Tsai, T.C., and Yang, M.L. (2009) Risk Management in the Construction Phase of Building Projects in Taiwan. Journal of Asian Architecture and Building Engineering, 8(1), pp.143-150.

11) Kim, S.C, Yoon, I.S., Kwon, O. C., Paek, I.H. (2005) Feasibility Analysis Simulation Model for Managing Construction Risk Factors. Journal of Asian architecture and building engineering, 4(1), pp.193-200.

12) Tsai, T.C., Furusaka, S., & Kaneta, T. (2002) Development of risk analysis method for building projects. Journal of Asian architecture and building engineering, 1(2), pp.157-164.

13) Cha, H.S., and Shin, K.Y. (2011). Predicting project cost performance level by assessing risk factors of building construction in South Korea. Journal of Asian Architecture and Building Engineering, 10(2), pp.437-444.

14) Park, C.S., Jang, H.S., Choi, S.I., Cho, H.C. (2010) Comparative analysis of strategic planning in construction firms. Journal of Asian Architecture and Building Engineering, 9(1), pp.25-30.

15) Korea Institute of Construction Technology (2013) Yearly Order Status. Construction orders Charts. (http://www.kict.re.kr/)

16) The bank of Korea (2013) Economic statistics, (http://www.bok.or.kr/main/korMain.action)

17) Korea Listed Companies Association (2013) Korea companies information. (http://www.klea.or.kr/)

18) International Contractors Association of Korea (2013) Yearly Order Status: Overseas construction orders Charts. (http://www.icak.or.kr)

19) Son, H.Y. (2014) A Management Objective Decision Model of Construction Firms based on Environmental Changes. Kyung-Hee University.