

# An Empirical Study on the Applicability of Growth-share Matrix in the Construction Industry

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**Abstract:** The growth-share matrix is a portfolio planning tool developed by the Boston Consulting Group (BCG) to assist competitive positioning in the international market including those in the construction industry. This matrix is helpful in balancing the firm's cash-flow, and it can suggest strategic directions for each business unit. However, its effectiveness and applicability have long been debated in the academic field due to the complex and unique industrial context of construction. To solve the dispute, this research clarifies the applicability of theories underlying the growth-share matrix to the construction industry. Empirical research based on actual financial data of Korean construction firms is adopted for the statistical analysis including one-way analysis of variance and correlation analysis. The results of this research show that empirical findings on the relationship between performance variables. In this context, this research can provide important insights on the concept of portfolio management in the construction industry.

**Keywords:** Positioning Matrix; Strategic Planning; Construction Industry; Empirical Study

## I. INTRODUCTION

To gain and sustain a competitive advantage in the international markets, firms need proper business strategies to fit their circumstances [1]. In this context, many researchers have proposed strategic positioning tools that concern with the competitive position in the marketplace and the areas of opportunity for their business. The growth-share matrix developed by Boston Consulting Group (BCG) is one of the familiar analytical tools in the field of strategic management. Since the matrix can suggest a strategic direction for each business, there are a considerable number of publications on the utilization of the growth-share matrix at the business unit level. In the construction sector also apply this tool for the strategic decisions such as diversification [2], entry into a new business [3], or market structure analysis [4]. However, for the competitive positioning on construction firm performance, its effectiveness and applicability remain debatable due to the complex and unique industrial context of construction.

Thus, this research clarifies the applicability of theories underlying growth-share matrix to the construction industry. In addition, this research provides empirical findings on the factors contributing to the strategic performance of construction firms. To achieve the purpose, this research starts with a description of the concept of the growth-share matrix and literature reviews on related works. Then, empirical analysis based on fourteen years of actual financial data the international construction firms in South Korea is conducted. Implications and future works that are derived from the empirical study is presented in the final part.

## II. THEORIES UNDERLYING GROWTH-SHARE MATRIX

In the early 1970s, the Boston Consulting Group developed a growth-share matrix that suggests that a business can formulate strategies based on two dimensions: relative market share and market growth. Relative market share, the horizontal axis in the matrix, indicates the internal strength of the firms in given business. It is defined as a ratio of the business sales against those of the leading competitor. Market growth, the vertical axis in the matrix, corresponds to the growth or attractiveness of the market [5]. In the growth-share matrix, each business unit in a firm is plotted on a four-quadrant grid. The business units in each quadrant can be classified into following states regarding cash-flow: cash cows, stars, questions, and dogs.

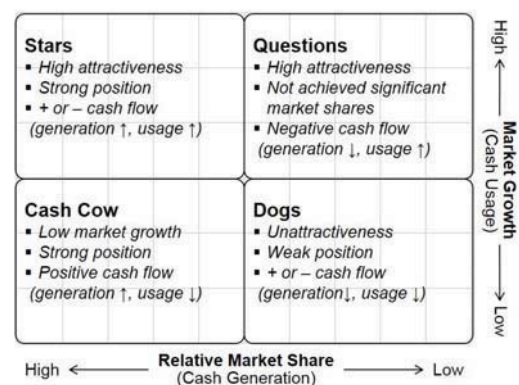


FIGURE 1  
FOUR QUADRANTS OF GROWTH-SHARE MATRIX

As shown in Figure 1, the growth-share can express cash used and generated; thus it is helpful in balancing a firm's cash-flow. In terms of cash-flow, the growth-share

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matrix approach based on the following assumptions – The experience curve effect exists for each market; thus overall production costs declined steadily as the experience of business unit accumulates [6]. Although such theories underlying growth-share matrix has long been debated in the discipline of management [7], assuming that the theories of growth-share matrix are valid, there is positive relationship between relative market share and profitability or cash-flow.

### III. RESEARCH DESIGN

#### A. Research methodologies

Empirical research is adopted for the data collection and analysis of firms' financial statement in the research presented here. This empirical research aims to examine the relationship between the business type of growth-share matrix and profitability (or cash-flow). The data were analyzed using inferential statistics: One-way analysis of variance (AONVA) and correlation analysis.

#### B. Firm selection and data collection

Firms that are classified as "General contractors (name code: F41000)" in Korean version of the NASDAQ market (KOSDAQ) are the sample of this research. Hence, a total thirty-one construction firms are selected for data collection. For a majority of the sample firms, data are collected over a fourteen year period from 2000 to 2013.

Databases, such as KISVALUE that operated by NICE Information Service Co., Ltd., are the primary source of data in this study. The data include market structure, firm's financial performance, and activities.

#### C. Research hypothesis

According to the growth-share matrix, there are appears to be a positive correlation between relative market share and profitability. As such, the first research hypothesis is that business with high relative market share has high profitability (H1). The second research hypothesis relied on the relationship between the cash needs of the business and market growth rate. More specifically, cash cows and dogs are regarded to have low investment requirements; whereas stars and questions require cash needs to sustain their competitive strength in rapidly growing markets. It thus follows that: cash-flow is associated with relative market share and market growth rate (H2).

TABLE I

COMPARISON OF FOUR BUSINESS TYPE OF GROWTH-SHARE MATRIX

Business Type	Data clustering		Research hypothesis test	
	Market growth rate	Relative market share	Profitability	Cash-flow
Cash-cow	Low	High	High	Positive
Stars	High	High	High	Around zero
Questions	High	Low	Low	Negative
Dogs	Low	Low	Low	Around zero

In this research, profitability is represented by net income and return on investment (ROI), refer to other empirical studies in the fields of construction management [8]. In addition, cash from operations activities is only considered for cash-flow analysis.

### IV. DATA ANALYSIS

#### A. Descriptive statistics

TABLE II  
 DESCRIPTION STATICS FOR A POPULATION AND SAMPLES

1) *Market (a Population)				
Total Sales	99,653 billion (40,180 billion)			
Growth Rate	9.36% (8.62%)			
2) Sample Firms				
Business Type	Cash-cow	Stars	Questions	Dogs
Sample Size	8	5	176	206
Proportion	2.0%	1.3%	44.6%	52.1%
**Relative Market Share	1.21 (0.18)	1.09 (0.09)	0.16 (0.23)	0.15 (0.24)
**Growth Rate	2.3% (4.2%)	25.0% (10.4%)	31.3% (22.5%)	-7.8% (15.1%)

\* Firms that are classified as "General contractors (code: F41000)" in KOSDAQ, KOSPI, KONEX and statutory auditor are selected as the population of this research.  
 \*\* Means are reported. Standard deviations are in parentheses.

Prior to the statistical analysis, this research classifies sample firms based on their competitive positioning dimensions: relative market share and growth rate. As a result, a total of 395 sample data is divided into four type; for example, eight of sample data including H firms in 2010 belong to cash-cow. The average value of a relative market share in this group over one; and this means they dominates its market. On the other hand, dogs group that has the largest number of sample data have failed to achieve competitiveness and their market growth rate shows negative value. Furthermore, the classification results appear that very few of the construction firms in South Korea can expect to show a profit in this market structure.

#### B. One-way analysis of variance

The second stage of this chapter is one-way ANOVA analysis that to answer the question of whether these four types of business differ from each other in terms of business performance. This analysis is performed across groups for each performance variables in terms of profitability (net income, ROI) and cash-flow.

TABLE III  
 FOUR BUSINESS TYPE AND THEIR PERFORMANCE

Performance variables	Cash-cow	Stars	Questions	Dogs	One-way ANOVA *F-value
Net Income (million ₩)	503,236	190,607	37,571	8,093	33.67
Return on Investments (%)	6.71	4.24	4.57	-0.03	13.34
Cash-flow from Operation (million ₩)	158,991	279,698	42,006	-17,512	9.93

\* P-values are significant at < 0.005

The result that are presented in Table 3 show that the performance variables among the four type of business are

statistically significant (i.e. p-value below 0.005). Firms in cash-cow are expected to outperform other three types of business in terms of return on investment. It implicates that there is a possibility of positive relationship between market share and profitability. However, regarding the cash-flow from operation activities, there is no significant findings on performance variables. Rather, unlike the assumption by the growth-share matrix, stars has the largest value of the positive cash flow among sample data. Therefore, the second research hypothesis – relationships between market growth and cash-flow – is dismissed.

### C. Correlation analysis

A series of the correlation analysis are carried out to quantify the strength of the linear relationship between the variables. This strength called that correlation coefficient shows if changes one variable will result in a change in the other variable. This research compare the correlation between two of the five variables – a)relative market share, b)market growth rate, c)net income, d)return on investment, and e)cash-flow from operation activities.

TABLE IV  
 RESULTS OF CORRELATION ANALYSIS

		a	b	c	d	e
a	Coefficient	1				
	p-value(both)					
	N	394				
b	Coefficient	.023	1			
	p-value(both)	.649				
	N	382	382			
c	Coefficient	.540**	.088	1		
	p-value(both)	.000	.086			
	N	394	382	394		
d	Coefficient	.125*	.326**	.442**	1	
	p-value(both)	.013	.000	.000		
	N	394	382	394	394	
e	Coefficient	.780**	-.026	.463**	.057	1
	p-value(both)	.000	.609	.000	.255	
	N	394	382	394	394	394

\* P-values are significant at < 0.05 (both side)

\*\* P-values are significant at < 0.01 (both side)

Detailed results have been summarized in Table 4. Neither net income nor cash-flow from operation activities is significantly correlated with market growth as evidenced by the p-values of 0.086 and 0.609, respectively. Thus, the second research hypothesis are rejected as we mentioned above analysis part. On the other hand, a high correlation coefficient that has the value over 0.7 exists between relative market share and cash-flow from operation activities. It indicates that the positive relationship between market share and cash-flow is valid.

### V. CONCLUSIONS

Sustaining a competitive position in the international markets is a major area of research in the discipline of strategic management. In this context, this research addresses the issue of application and adoption of the business strategy model, growth-share matrix, to the construction industry. Empirical findings of this research, through the static analysis include one-way analysis of

variance and correlation analysis, show that the relationships between market growth and firm's performance variables such as net income, return on investment, and cash-flow from operation activities is not statistically significant. However, the relative market share can be affected at profitability and cash-flow. Therefore, theories underlying the growth-share matrix have some analytical limitations to apply the construction industry. This research can be empirical evidence that directly examines the effectiveness and applicability of the growth-share model for the competitive positioning in the construction market. The future works of this research are that developing the idea of improved growth-share matrix for the construction industry based on proposed empirical findings.

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