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Effects of Competitive Strategies on Building Production Innovation in Construction Companies

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***Abstract*—**This research study aims to identify the impact of two factors –growth and competitive strategies- on a set of building production innovation strategies. It was conducted a questionery survey to collect data from construction professionals and it was asked them the importance level of predicted innovation strategies for corporate strategies. Multiple analysis of variance (MANOVA) was employed to see the main and interaction effects of corporate strategies on building innovation strategies. The results indicate that growth strategies such as entering in a new a market or new project types has a greater effect on innovation strategies rather than competitive strategies such as cost leadership or differentiation strategies. However the interaction effect of competitive strategies and growth strategies on innovation strategies is much bigger than the only effect of competitive strategies. It was also analyzed the descriptive statistics of innovation strategies for different competitive and growth strategy types.

***Keywords*—**competitive strategy, growth strategy, innovation, construction company, MANOVA

I. Introduction

CONSTRUCTION management studies generally focus on problems at the project level and because of that there is a lack of studies on strategic issues at the firm level. As Kale and Arditi (2002) [1] emphasized many of published works are largely descriptive in the nature and rely on anecdotal evidence. Understanding of the competitive strategy of construction firms has stagnated within recent years, with little in the way of new insights since the contributions of Lansley (1987) [2] and Hillebrandt et al. (1995) [3]. More empirical findings are required to renovate the existing conceptual strategic models and strategic management theories in construction management literature. In this context this study aims to find some empirical findings for contributing to the strategic management literature in construction at the firm level. In the construction industry globalization with knowledge-based economy affacted also the world market conditions and it caused some alterations for it. Especially the customers satisfaction needs have moved to toward a great emphasis on innovative solutions which can be in the service processes or in the building production processes. Struggling to compete in the world market has a strong relationship with strategies so called long-range plans, methods and approaches that a company adopts in order to reach its goals for gaining competitive advantage. There are some hierarchical management levels of strategies in construction companies. At the corporate level of the firm, senior managers develope a corporate strategy that is companywide and is concerned with creating competitive advantage (Langford and Male, 2001; [4]).

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On the other hand at the functional level there are strategies such as on innovation, organization, marketing and processes etc. Seadan et al. (2003) [5] noted that recent years innovation strategies became more important for gaining competitive advantage and they are related with corporate strategies. So it can be suggested that strategies on different organizational level have interactions and they affect each other. In this context the research question examined in this study addressed the impact of two factors–growth and competitive strategies at the corporate level- on a set of building production innovation strategies at the functional level. So this paper seeks to find out how the innovation strategies change if the type of competitive strategy or growth strategy differs.

The potential benefit of this research is to compose a framework for relationship between corporate strategies and innovation strategies. The findings are interpreted to provide valuable information for construction managers when they consider how to improve their competitiveness related to innovation capabilities in construction companies.

II. Theoretical Background

A. Strategies in construction companies

Strategy is a contested concept (Green et al., 2007; [6]). The generic literature on strategy is characterized by a diverse range of competing theories and alternative perspectives. Traditional models of the competitive strategy of construction firms have tended to focus on exogenous factors. In contrast, the resource-based view of strategic management emphasizes the importance of endogenous factors (Green et al., 2007) like innovative capabilities of company or strategic management issues, etc. Recent years in the construction management literature there were many efforts on corporate strategy, strategic planning and management with many publications (Abdul-Aziz, 1994[7]; Warszawski, 1996[8]; Chinowsky and Meredith, 2000[9]; Langford and Male, 2001[4]; Kale and Arditi, 2002[1]).

More recently, Seaden et al. (2003)[5] examine the relationship between strategies and innovative practices and find that most listed business strategies are positively related to innovative practices. So this research also makes the corporate strategies and innovation strategies its research topics and it aims to identify the effects of corporate strategies on innovation strategies.

B. Corporate Strategies

As mentioned before in companies there are several levels of management. Corporate strategy is the highest of these levels in the sense that it is the broadest and the most comprehensive. It gives direction to corporate values such as corporate culture, corporate goals, and corporate missions and visions. And it mainly concerns with competition issues.

In this study it was embraced two corporate strategies for further research: growth and competitive strategies which are the most common ones in construction management literature.

Growth strategies deal with expand and grow of existing assets and capabilities for getting more yield while developing the position of company in the market. Growth strategies are in general desirable for managers and it create a positive image by the sense of stakeholders. Growth of the corporations come about two different ways so quantative or qualitative growth. Any kind of growth eventuates by two forms: changing the existing business description (adding new products and services, entering new markets, alliances etc.) or changing the speed and efficiency of activities (raise of production capacity, changes of marketing activities, etc.). Caves (1982) [22] identified four basic ways to expand internationally, from the lowest to the highest risk: (1) exporting; (2) licensing and franchising; (3) strategic alliances; and (4) wholly owned foreign subsidiaries. And Ling et al. (2005)[23] focused in their research about business strategies of construction companies mainly on last two growth strategies because of their coherence with construction business. Due to research results in the literature in this study growth strategies in construction companies were adopted with its four types: (1)Entry to markets in new regions; (2) Providing services of new type projects; (3) Entry to a new business area; (4) Acquisition or alliances.

Porter's three generic competitive strategies have been widely used in the management field. Porter (1980) suggests that "...there are three potentially successful generic strategic approaches to outperforming other firms in an industry: overall cost leadership, differentiation and focus".

The cost leadership strategy originated from experience curve concept which was popular in 1970s. When implementing cost leadership strategy, a firm's main objective is to become the low cost producer in its industry (Yongtao, 2008). Based on the analysis of industry structure, a firm needs to exploit all sources of cost advantage in its industry. Thompson and Stricklend (1995)[11] noted that companies may obtain cost leadership in two ways: (1) activities creating value and improve internal rate or return, (2) Elimination of some insignificant cost parameters. Cost leadership enables a firm to achieve an above average performance in its industry.

Differentiation strategy is to create a product or service which is unique in an industry (Yongtao,2008 [10]). The unique attributes of the product or service should provide superior values to the customers. Since the product or service is unique in one or more dimensions, the price elasticity of demand will be reduced and customers tend to be brand loyal. There are different ways for differentiation. "Differentiation can be based on the product itself, the delivery system by which it is sold, the marketing approach, and a broad range of other factors... a differentiator, therefore, must always seek ways of differentiating that lead to a price premium greater than the cost of differentiating... the logic of the differentiation strategy requires that a firm choose attributes in which to differentiate itself that are different from its rivals" (Porter, 1985). Furthermore Zhao, Shen, and Zuo (2009) [12]discussed the differentiation concept in construction companies in the form of cost differentiation and resource differentiation.

The focus strategy is to select a few target markets for competition. This strategy enables a company to better meet the needs of the target market than its competitors who compete more broadly (Yongtao, 2008 [10]). It is important to select appropriate target market for implementing this strategy. Porter describes focus strategy as "Segment structural attractiveness is a necessary condition since some segments in an industry are much less profitable than others... most industries have a variety of segments, and each one that involves a different buyer need or a different optimal production or delivery system is a candidate for a focus strategy"(Porter, 1985 [13]). Mixed competitive strategies are actually a combination of Porter's three main competitive strategies like cost leadership with differentiation capabilities or differentiation within effect of focus strategies.

C. Innovation Strategies

Innovation strategies can be described as R&D investments, organizational learning and use of new technologies in operations and organizational processes. Innovation concept in construction industry has been studied by many researchers (Tatum, 1989 [14]; Slaughter, 1993[15]; Nam and Tatum, 1997[16]; Lampel et al., 1996[17]; Bernstein, 1996[18]; Seaden and Manseau, 2001[19]). Researches on innovation in construction demonstrated that innovation strategies are especially important for long term success of the company but construction companies do not tend to put in the practice such strategies. Bossink (2004)[20] highlighted that innovation concept has a great impact on competitive strategies that also strength the assumption of this research.

As a matter of fact, several innovations occur at the workface of large complex projects. In the scope of this research innovation strategies of construction companies is more related with using new technologies in building production process. For further research it was derived three building production innovation strategies from existing literature that are the most common innovation strategies in building production process: (1)Strategies on innovation of design and metarial; (2) Innovation strategies in equipment utilization; (3)Innovation strategies in production organization (like prefabrication, etc.).

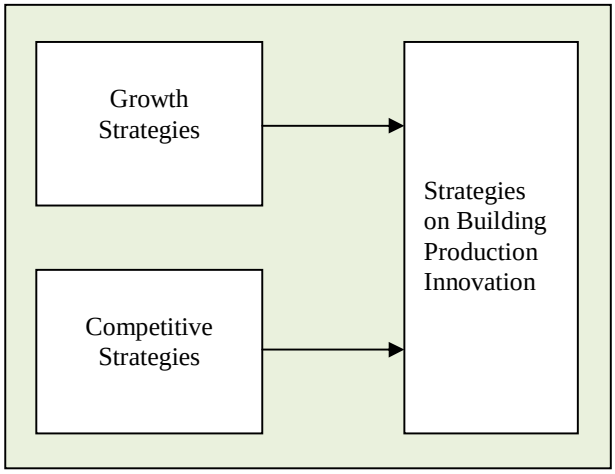

Fig. 1 Research Framework

III. Methodology

A. Survey Design

The survey questionnaire was designed to identify the importance level of innovation strategies that construction companies uses for competing in international construction market. It was designed with two sections consisting of the firm and respondents general information and importance ratings of innovation strategies for different corporate strategic combinations. The first section was intended to obtain general demographic information such as type of services, employee number and the nature of the clients and also information about respondents such as specialization area, education level and age. The latter part was aimed at identifying the importance level of innovation strategies for some type of growth strategies and competitive strategies. The survey was a six-point Likert Scale from "not important at all" to "critically important" additionally the corporate strategies were asked as nominal question format. and worked before in a foreign country in construction business. The information about the career of respondents told us that %51 of them are engineer and %20,5 of them are architect . In addition to it %51,8 of respondents have bachelor degree whereas %31,6 have a degree of master degree or higher academic degrees such as Ph.D.

B. Data analysis and results

Multiple analysis of variance (MANOVA) was used to see the main and interaction effects of categorical variables on multiple dependent interval variables. MANOVA uses one or more categorical independents as predictors and it provides a means for determining the extent to which groups of respondents (formed by their characteristics on the nonparametric independent variables) differ in terms of the dependent measures (Hair, et al.,2006 [21]). In this study competitive and growth strategies in construction companies each one with four categories are the categorical independent variables as predictors and the innovation strategies are dependent measures with Likert scale (rated from 1 to 6). So it was compared groups formed by categorical independent variables on group differences in a set of interval dependent variables. It was also identified the independent variables which differentiate a set of dependent variables the most.

C. Sampling and Data collection

The respondents of the survey were selected from construction professionals working for construction companies operating internationally and listed 2010 ENR Top Global 225 Contractor List. "The competitive strategies and innovation strategies in construction companies survey" was sent via mail, e-mail and also delivered by hand between the days August 2011- December 2011. A total of 82 surveys were received from contacted construction managers.According to the demographic information %47 of survey respondents were in between 26-39 and %45,8 of them were in between 40-59 age. %79 of respondents were senior or middle level managers

Multivariate tests for group differences in innovation strategies importance measures across groups contains the MANOVA results for the main effects of growth and competitive strategies in addition to the tests for the interaction effect of them.

The impact of the two independent variables can be compared by examining the observed power (Table I). We can see from the table that the observed power of growth strategies (0,754) is much bigger then competitive strategies' (0,266) on innovation strategies. When compared to either independent variable, the interaction effect of two corporate strategies on building production innovation is greater than the only effect of competitive strategies but not greater than the effect of growth strategies.

TABLE I
MULTİVARİATE TESTS FOR GROUP DİFFERENACES İN İNNOVATİON STRATEGİES

Effect		Hypothesis					Partial Eta	Noncent.	
		Value	F	df	Error df	Sig.	Squared	Parameter	Observed Power[b]
Competitive Strategies (CS)	Pillai's Trace	,063	,466	9,000	195,000	,896	,021	4,194	,226
	Wilks' Lambda	,938	,457	9,000	153,476	,901	,021	3,329	,181
	Hotelling's Trace	,066	,450	9,000	185,000	,906	,021	4,047	,218
	Roy's Largest Root	,047	1,025[c]	3,000	65,000	,387	,045	3,076	,266
Growth Strategies (GS)	Pillai's Trace	,217	1,689	9,000	195,000	,094	,072	15,199	,764
	Wilks' Lambda	,795	1,683	9,000	153,476	,097	,074	12,181	,640
	Hotelling's Trace	,242	1,661	9,000	185,000	,101	,075	14,953	,754

	Roy's Largest Root	,161	3,480[c]	3,000	65,000	,021	,138	10,441	,753
CS* GS	Pillai's Trace	,237	1,115	15,000	195,000	,345	,079	16,730	,703
	Wilks' Lambda	,779	1,103	15,000	174,317	,357	,080	15,168	,644
	Hotelling's Trace	,265	1,088	15,000	185,000	,370	,081	16,324	,687
	Roy's Largest Root	,154	2,002[c]	5,000	65,000	,090	,133	10,009	,635

Note: Innovation strategies were rated from 1 to 6 (1=not important at all and 6=critically important).

TABLE II
TESTS OF BETWEEN-SUBJECTS EFFECTS

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Intercept	Strategies on innovation of design and metarial	61,331	1	61,331	71,449	,000	,524	71,449	1,000
	Innovation strategies in equipment utilization	60,407	1	60,407	66,237	,000	,505	66,237	1,000
	Innovation strategies in production organization	63,626	1	63,626	68,193	,000	,512	68,193	1,000
Competitive Strategies (CS)	Strategies on innovation of design and metarial	1,505	3	,502	,584	,627	,026	1,753	,165
	Innovation strategies in equipment utilization	,624	3	,208	,228	,877	,010	,684	,091
	Innovation strategies in production organization	,001	3	,000	,000	1,000	,000	,001	,050
Growth Strategies (GS)	Strategies on innovation of design and metarial	5,375	3	1,792	2,087	,110	,088	6,262	,510
	Innovation strategies in equipment utilization	5,631	3	1,877	2,058	,114	,087	6,174	,504
	Innovation strategies in production organization	9,672	3	3,224	3,455	,021	,138	10,366	,750
CS* GS	Strategies on innovation of design and metarial	6,895	5	1,379	1,607	,171	,110	8,033	,526
	Innovation strategies in equipment utilization	4,588	5	,918	1,006	,421	,072	5,031	,336
	Innovation strategies in production organization	4,319	5	,864	,926	,470	,066	4,629	,310

quared = ,347 (Adjusted R Squared = ,226), b. Computed using alpha = ,05, c. R Squared = ,258 (Adjusted R Squared = ,121), d. R Squared = ,331 (Adjusted R Squared = ,208) Note: Innovation strategies were rated from 1 to 6 (1=not important at all and 6=critically important).

TABLE III
MEAN SCORES OF INNOVATION STRATEGIES FOR COMPETITIVE STRATEGY TYPES

Dependent Variable	Competitive Strategies			95% Confidence Interval	
		Mean	Std. Error	Lower Bound	Upper Bound
Strategies on innovation of design and metarial	Cost Leadership	5,021[a,b]	,393	4,236	5,806
	Differantation	4,352[a,b]	,452	3,449	5,255
	Focus	4,777[a,b]	,508	3,763	5,791
	Mixed	4,658[a]	,302	4,055	5,260
Innovation strategies in equipment utilization	Cost Leadership	4,996[a,b]	,405	4,187	5,805
	Differantation	4,636[a,b]	,466	3,705	5,567
	Focus	4,480[a,b]	,523	3,435	5,525
	Mixed	4,269[a]	,311	3,648	4,890
Innovation strategies in production organization (like prefabrication)	Cost Leadership	4,838[a,b]	,410	4,019	5,657
	Differantation	4,824[a,b]	,471	3,883	5,766
	Focus	4,482[a,b]	,529	3,425	5,539
	Mixed	4,320[a]	,314	3,692	4,948

TABLE IV
MEAN SCORES OF INNOVATION STRATEGIES FOR GROWTH STRATEGY TYPES

Dependent Variable	Growth Strategies			95% Confidence Interval	
		Mean	Std. Error	Lower Bound	Upper Bound
Strategies on innovation of design and metarial	Entry to markets in new regions	4,685[a]	,160	4,366	5,004
	Providing services of new type projects	4,902[a]	,390	4,123	5,681
	Entry to a new business area	3,469[a,b]	,540	2,390	4,548

	Acquisition or alliances	4,829[a,b]	,544	3,744	5,915
Innovation strategies in equipment utilization	Entry to markets in new regions	4,793[a]	,165	4,464	5,122
	Providing services of new type projects	4,524[a]	,402	3,721	5,327
	Entry to a new business area	3,121[a,b]	,557	2,009	4,234
	Acquisition or alliances	4,847[a,b]	,560	3,728	5,966
Innovation strategies in production organization (like prefabrication)	Entry to markets in new regions	4,528[a]	,166	4,195	4,860
	Providing services of new type projects	4,438[a]	,407	3,626	5,250
	Entry to a new business area	2,773[a,b]	,563	1,648	3,898
	Acquisition or alliances	5,532[a,b]	,567	4,400	6,664

Note: Innovation strategies were rated from 1 to 6 (1=not important at all and 6=critically important).
a. Based on modified population marginal mean.

Tests of between subjects' effects give us information about the impact of growth and competitive strategies in comparable form for each innovation strategy (Table II). The effect sizes (eta squared) for growth strategies relatively greater than competitive strategies and the interaction effect. Especially the effect of growth strategies on innovation in production organization strategy is the biggest one (eta squared=0,138) antagonistically the effect of competitive strategies on innovation in production organization strategies is the smallest one (eta squared=, 0).

Considering the analysis of mean scores of innovation strategies for different competitive strategy types it can be suggested the most significant relation is being in between the "Strategies on innovation of design and material" and cost leadership strategies. It can be assumed that for having cost leadership the most important factor is applying innovative solutions in design and material prediction (Table III). Furthermore, the weakest mean score for "innovation strategies in equipment utilization" is for competitive strategy type "mixed" (μ=4,269) whereas "innovation in equipment utilization" is more important for cost leadership rather than other competitive strategy types (μ=4,838).

According to the analysis of mean scores of innovation strategies for different growth strategy types it can be suggested that different innovation strategies stand out with different importance level for different types of growth strategies. We can read from Table IV that the mean score of "innovation in design and material" is lower (μ=3,469) if the type of growth strategy is to "enter a new business area" and higher (μ=4,829) if the growth strategy type is to "providing services of new types of projects" (see Table 4). Furthermore, the weakest mean score for "innovation strategies in equipment utilization" is for growth strategy type "entry to a new business area" (μ=3.121) whereas "innovation in equipment utilization" is the more important for acquisition or alliances type growth strategy rather than other growth strategy types (μ=4,847). In addition to this results it can be assumed that if a construction company growing up with Acquisition or alliances it would be more importance having some innovations on building production organization.

IV. Concluding Remarks

Strategic management is an essential activity of senior managers in construction companies like in any business firm. It actually deals with gaining competitive advantage and increasing the survival capacity of the company in the market. As Seaden et al. (2003) mentioned before there is a relationship between corporate strategies and innovative practices and the most listed business strategies are positively related to innovative practices this paper aims to observe how the importance e level of building innovation strategies differs when the type of growth strategy or competitive strategy changes. The most significant finding of this study is that the effect of growth strategies on innovation strategies is bigger than competitive strategies' and also bigger then interaction effect of two corporate strategies. Another important contribution of this study is the identification of importance levels of innovation strategies with mean scores across the different competitive and growth strategy types. "Strategies on innovation of design and material" is the most important innovation strategy when the competitive strategy is cost leadership whereas "innovation strategies in production organization" is the most important for acquisition or alliances type of growth strategies.

In the global conjuncture innovation should be considered as an important strategy of the construction industry for gaining competitive advantage. The findings of this research provide some very interesting insights into strategic management and innovation concept for construction professionals for creating competitive advantage and increase growth rates among their competitors in the international construction sector.

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